THE physical therapy REVIEW

Volume 33 - Number 2 February 1953

Proprioceptive Facilitation Technics for Treatment of Paralysis — KABAT and KNOTT

Electrical Stimulation in Serratus Anterior Paralysis (Winged Scapula) — RUDD

Strength of the Elbow Flexor Muscles — DOWNER

New Useful Devices in the Rehabilitation of the Hemiplegic Hand — WEINSTEIN and GORDON

PUBLISHED MONTHLY BY
THE AMERICAN PHYSICAL THERAPY ASSOCIATION

TECA CD4P-S

a low price generator with variable frequencies for conventional low-volt therapy

- **Muscle Stimulation**
- **Ion-Transfer Therapy**
- **Electro Diagnosis**
- **Medical Galvanism**

AVAILABLE CURRENTS:

A. C., from 18 to 3000 cycles per second in sine wave and square wave.

D. C., straight and any desired degree of pulsation.

AC and DC PULSES of 1 m s duration (may be regulated from 1 to 100 pulses per second).

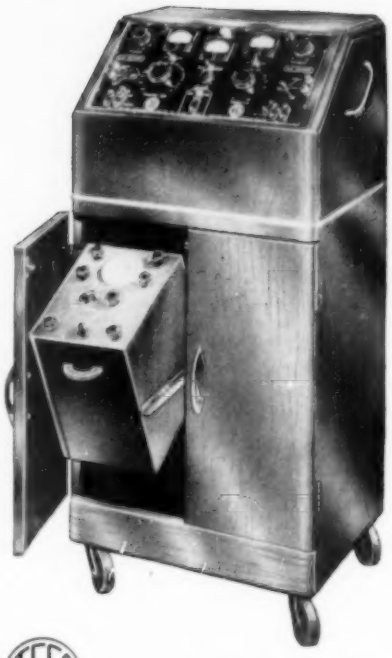
ALL CURRENTS SURGING (except pulses) from 6 to 60 surges per minute.

SUPERIMPOSED CURRENTS; any alternating current can be superimposed on any direct current, or vice versa.

OSCILLOSCOPE OPTIONAL; CD4P-S may be equipped with a 3" oscilloscope.

TWO CIRCUITS; separate circuits and controls for A. C. and D. C. for easier operation and wider range of application.

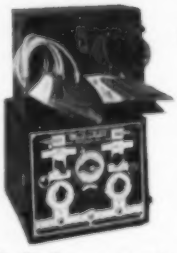
For literature, price, demonstration, write Dept. PT-2.



TECA CORPORATION 139 EAST 23RD ST. NEW YORK 10, N.Y.

Simple To Operate Reliable • Efficient

Medcolator



ELECTRICAL MUSCLE STIMULATION

Adjunct therapy for

1. . . . Strains . . . Sprains . . . Dislocations

. . . Other trauma of muscle and skeletal system

2. To Retard Atrophy
3. For Muscle Re-education . . . It helps to Reestablish Muscle Sense
4. To help Regain and Preserve Mobility and Function of Muscles

AN ANCILLARY TO MASSAGE DRUGS...HEAT THERAPY...OR MAY BE USED ALONE

Write for literature and demonstration

MEDCO PRODUCTS CO.

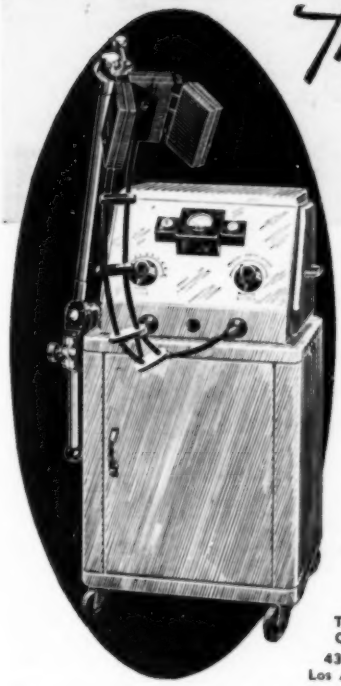
3607 E. Admiral Place Tulsa 12, Oklahoma
P.O. Box 3275, Dept. T

EVEREST & JENNINGS *Folding* WHEEL CHAIRS *for all ages*

Everest & Jennings folding wheel chairs help children of all ages to enjoy outdoor living. Everest & Jennings cooperate with the physical therapist in selecting the chair to help speed rehabilitation of the patient.

Send for free booklet on invalid aids.

EVEREST & JENNINGS
761 No. Highland Ave., Los Angeles 38, California



The BIRTCHER Challenger

SHORT WAVE DIATHERM

PROVIDES ALL METHODS OF APPLICATION...

F.C.C. APPROVED

WHATEVER the method of application, unexcelled diathermy treatment may be given with the Challenger. The Challenger provides more diathermy energy than is required in any application and the diathermy provided is dependable and safe to all parts of the body—even around the eyes and other critical areas.

The Challenger is simple to operate. Preliminary adjustment is reduced to a minimum by one-knob control. The nurse or technician can quickly master the operation of the Challenger.

The Challenger is a rugged unit that gives life-long, trouble-free service and is unconditionally guaranteed, including tubes, for a period of two years. Relatively inexpensive in price, the Challenger is a handsome unit that adds to the appearance as well as the efficiency of any office or clinic.

Be sure to see a Challenger before you buy any short wave diatherm for office or clinic.

Federal Communications Commission Approval No. D529 Write for free literature.

THE BIRTCHER CORPORATION
4371 Valley Blvd.
Los Angeles 22, Calif.

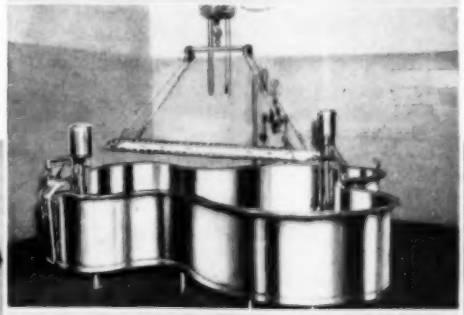
NAME_____
ADDRESS_____
CITY_____ STATE_____

I L L E

Stationary Subaqua Hydromassage Therapy Tanks

A Leader in Performance, Design and Quality for Nearly 30 Years

HM-601—COMBINATION ARM, LEG, AND HIP TANK



HM-801—FULL BODY IMMERSION TANK

HM-500—ARM TANK

Literature on Request

I L L E
ELECTRIC CORPORATION
50 Mill Road, Freeport, L. I., N. Y.

Reprints Available

INFORMATIONAL MATERIAL — No Charge

Schools of Physical Therapy — A list of schools approved by the Council on Medical Education and Hospitals of the American Medical Association.

Suggestions for Prospective Students — Outlines the professional course of study for college students preparing for physical therapy. Of value to the high school student who is planning a college program.

Questions and Answers — A concise outline describing physical therapy education and applications.

Code of Ethics of the American Physical Therapy Association.

Personnel Policies for Physical Therapists.

Postgraduate Courses for Physical Therapists.

Recruitment Poster — Attractive, colorful, throw-away bulletin board poster to help vocational guidance and recruiting.

U. S. Army, U. S. Air Force, and Veterans Administration Pamphlets — Separate folders listing education, employment or service opportunities in each organization.

SCIENTIFIC REPRINTS — Charge as Indicated

One free copy to each member of the Association

Physical Therapy in Medical Diseases of the Chest — Evelyn A. May (10¢)

Physical Therapy in the Early Care of Cold Injuries — Mary E. Sacksteder, Capt., WMSC (10¢)

Administration of a Community Rehabilitation Center — Hazel E. Furscott (10¢)

Wheel Chairs — George G. Deaver, M.D. (5¢)

Methods of Clinical Instruction in Physical Therapy — Beatrice E. Whitcomb, Major, WMSC (10¢)

Physical Therapy in the Home — Arthur L. Watkins, M.D. (10¢)

Physical Therapy in State Crippled Children's Program — Clara M. Arrington (5¢)

Physical Therapy Program for the Upper Extremity Amputee — Hyman Jampol (10¢)

The Rehabilitation of Aphasics — Dorothy Britton (10¢)

SPECIAL MATERIALS — Charge as Indicated

Job of the Physical Therapist — A complete description of what the physical therapist does, where he works, how he functions in the professional field and worker characteristics. (Single copies are free to counsellors, libraries and chapters; additional single copies 50¢ each, 10-25 copies 35¢ each, 25 or more copies 25¢ each.)

Bibliography on Natural Childbirth (10¢)

Reading References for Electrical Diagnosis and Electrical Stimulation (10¢)

Film List of Special Interest to Physical Therapists and Student Physical Therapists (15¢)

Physiology of the Heart and Circulation and Its Clinical Application in Physical Medicine ($1.00)

Essentials of a Hospital Department — Physical Therapy (To members 25¢)

Plan and Specifications for an All-Welded Steel Treatment Pool (No charge)

Organizational Guide for Schools of Physical Therapy (No charge)

State Registration of Physical Therapists — Abstracts of state laws regarding registration of physical therapists (No charge)

Special Issues of the Review

Polio Issue (July 1951) (50¢)

Polio Issue (July 1952) — 75¢ (10 to 50, 50¢; 50 to 100, 35¢; 100 or more, 25¢)

Cerebral Palsy Issue (February 1952) (50¢)

All requests should be addressed to American Physical Therapy Association
1790 Broadway, New York 19, New York

Poster Contest Extended

Because of the interest expressed in our recruitment poster contest and the desire to secure the best possible design the deadline for entries has been extended to April 1, 1953 instead of the March date originally announced.

Mimeographed copies of the contest rules will be sent to all chapter presidents for distribution by the members. These should go to high school and college art departments and all other known local sources of contestants.

The judges will be announced in the March issue of the Review and will include a nationally known designer, public relations director, and physical therapist, as well as a high school student.

Georgia Warm Springs Foundation
GRADUATE COURSE
Physical Therapy and Occupational Therapy in the Care of Poliomyelitis

This course is open to graduates of approved schools in physical therapy and occupational therapy. Such graduates must be members of the American Physical Therapy Association and/or the American Registry of Physical Therapists, and Occupational Therapy Association.

Tuition: None. For scholarship to cover transportation and maintenance, contact National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

Entrance Dates: First Monday in January, April, July and October.

Duration of Course: The course is divided into two parts:

Part I. Over-all care of convalescent polio with particular emphasis and special training in muscle testing and muscle reeducation.

Part II. Particular emphasis and special training in functional testing and functional retraining.

Each part lasts three months and only selected students who have completed Part I will be admitted to Part II. All students applying for Part I must be willing to remain through Part II if selected.

For Information Write:
Robert L. Bennett, M.D.
Georgia Warm Springs Foundation
Warm Springs, Georgia

POSTER CONTEST

PRIZES

Offered by the American Physical Therapy Association for the winning design.

Recruitment of Physical Therapists
is the theme.

THE FUTURE OF THE PROFESSION DEPENDS ON RECRUITING MORE PHYSICAL THERAPISTS.

All *Review* readers are urged to participate in the contest.

For details see page 88

☆

AMERICAN PHYSICAL THERAPY ASSOCIATION
1790 Broadway, New York 19, New York

J. A. PRESTON CORPORATION NEW YORK U.S.A.

a COMPLETE LINE

of Equipment for

PHYSICAL MEDICINE AND REHABILITATION

ALL your needs supplied by ONE reliable source.

REHABILITATION: Progressive Resistance Exercise Units; **Walking Parallel Bars and Exercise Staircases** of various designs; Invalid Walkers; Posture Training Mirrors, single and triple; Stall Bars; Pulley Weights; **Shoulder Wheels;** Shoulder Ladder; Supinator-Pronator; various types of **Bicycle Exercisers; Restorator,** a new device for active exercise of upper and lower extremities; Kanavel Table; **Manuflex,** with the new "Gym Kit" for hand therapy; Ankle exercisers; **Quadriceps-Gastrocnemius-Footdrop Boots;** Foldaway Jim, a gymnasium for the office or patient's home; **Sayre's Headslings,** with or without scales to measure amount of traction; **Gymnasium Mats** in various sizes, thicknesses and coverings; **Crutches and Canes;** Cerebral Palsy Equipment.

PHYSICAL THERAPY: Whirlpools for every use; Hubbard Tanks; Paraffin Baths; **"Moistaire"** Heat Therapy Units; **Hydrocollator** Master Units and Steam Packs; Shortwave Diathermy, "Hanovia" and other makes; **Galvanic-faradic-sinusoidal** Generators; Hanovia Ultraviolet Lamps; Heat Lamps and Bakers; **Ultrasonic** Generators; Treatment Tables; Timers.

DIAGNOSTIC APPARATUS: Chronaximeters; Electromyographs; Dynamometers; Ergographs; Goniometers; Oscillometers; Thermocouples.

NEW ITEMS OF INTEREST
Literature on Request

NON-SKID ICE GRIPPERS — fit all types of crutches and canes. Pair $4.50

AMBULATORY CERVICAL TRACTION APPARATUS — is set on patient's shoulders and strapped around waist. Price $37.50

Send for your free copy of our illustrated Catalog No. 1052. Inquiries invited.

J. A. PRESTON CORPORATION
175 FIFTH AVE. · NEW YORK 10, N. Y. · ORegon 4-9044

THE physical therapy REVIEW

52 Vol. 33, No. 2

published monthly by the
American Physical Therapy Association
at 1790 Broadway, Room 1315
New York 19, N. Y.

Editor: E. Jane Carlin

Associate Editors: Sara J. Houtz, Mary E. Kolb, Beatrice Whitcomb

Managing Editor: Carol Vance

Assistant Business Manager: Shirlee Stern

Membership in the American Physical Therapy Association is $15.00 a year, including a subscription to THE PHYSICAL THERAPY REVIEW. Subscriptions for nonmembers to THE PHYSICAL THERAPY REVIEW, $6.00 a year; $6.75 in Canada and foreign countries. Single copies 75 cents. (50 cents to members.) Reentered as second class matter August 11, 1949, at the post office at New York, N. Y., under the act of August 24, 1912.

The statements in the manuscripts published in THE PHYSICAL THERAPY REVIEW are made solely on the responsibility of the author. The American Physical Therapy Association does not assume any responsibility for statements contained therein. Manuscripts accepted for publication in THE PHYSICAL THERAPY REVIEW are for exclusive publication and may not be published elsewhere without permission.

Officers

President ..... Harriet S. Lee
Vice-president ..... Mary E. Nesbitt
Secretary ..... Dorothy Voss
Treasurer ..... R. Lewis Brown
Speaker, House of Delegates ... E. Jane Carlin

Directors

Dorothy Fredrickson ..... Nashville, Tenn.
Marguerite I. Irvine ..... Seattle, Wash.
Margaret A. Kohli ..... Madison, Wis.
Mary Clyde Singleton ..... Durham, N. C.

Advisory Council

William T. Green, M.D. ..... Boston, Mass.
Charles S. Wise, M.D. .... Washington, D. C.
Samuel M. Wishik, M.D. ..... Pittsburgh, Pa.
Aura Severinghaus, Ph.D. ... New York, N. Y.
Charles U. Letourneau, M.D. .. Chicago, Ill.

Standing Committees

Education—Lorraine Lake .... St. Louis, Mo.
Exhibits—
Hazel R. Stephens ..... Warm Springs, Ga.
Nominations—Louise Bailey .... Chicago, Ill.
Program—Dorothy Graves, Los Angeles, Calif.
Publication—E. Jane Carlin .. Jenkintown, Pa.
Public Laws—Alice Chesrown. St. Paul, Minn
Relations—
Clara M. Arrington .... Washington, D. C.

National Office Staff

Executive Director ..... Mildred Elson
Assistant Executive Director .. Mary E. Haskell
Educational Consultant .... Dorothy R. Hewitt
Poliomyelitis Consultants
Lucy Blair, Ruth Whittemore

Table of Contents:

Proprioceptive Facilitation Technics for Treatment of Paralysis — Herman Kabat, M.D., and Margaret Knott 53

Electrical Stimulation in Serratus Anterior Paralysis (Winged Scapula) — J. L. Rudd, M.D. 64

Strength of the Elbow Flexor Muscles — Ann H. Downer 68

New Useful Devices in the Rehabilitation of the Hemiplegic Hand — Max V. Weinstein, M.D., and Alan Gordon 70

Meet Our New Contributors 67

Editorials 74

World Confederation for Physical Therapy . 78

Association Activities 81

Conference 1953 82

Membership News 83

Index to Current Literature 86

List of Approved Schools 87

General News 89

Abstracts 90

Book Reviews 94

Our Book Reviewers for February 95

Available in a Microfilm Edition

The Physical Therapy Review

Official Publication of The American Physical Therapy Association

Volume 33 **February 1953** **Number 2**

*Proprioceptive Facilitation Technics for Treatment of Paralysis**

Herman Kabat, M.D., Ph.D., and Margaret Knott, B.S.

Changes in therapy can best be understood when they are related to fundamental changes in philosophy and scientific approach to disease and its treatment. A major change is occurring in physical therapy for overcoming paralysis. For many years, the treatment of paralysis was based on rest and a gradual increase in activity, with strict avoidance of fatigue, and routine progression in treatment from passive motion to assistive motion, through free motion with gravity eliminated, free motion against gravity, and, finally, resistive exercise. Essential components of this treatment routine are careful isolation of motion to single muscles or single motions and avoidance of stretch of the muscles.

This routine of therapy originated in a period when neurophysiology was in its infancy, and rest was the prescribed treatment for practically every type of disease or disability. It was based on the theory that activity was harmful, except in very small doses, and that paralysis could be increased by overactivity and fatigue. This approach was carried to the point where rest was enforced by immobilization in splints and casts continuously for months.

In recent years, there has been a strong trend away from prolonged rest in many diseases. Medical and surgical patients are leaving the bed and the hospital much earlier in order to prevent disuse and maintain function, and the results have been considerably better than before. Prolonged immobilization of paralyzed limbs has been largely discarded with the realization that immobilization is harmful because of disuse of the neuromuscular mechanism and detrimental effects on circulation and joint mobility.

While neuromuscular reeducation is still based largely on gradual progression from passive and assistive motion to resistive therapy, there is a recent trend for earlier and more intensive application of resistive therapy. Our work at the Kabat-Kaiser Institutes in developing new technics for neuromuscular reeducation for paralysis has led us to discard the basic principles of the earlier treatment routine entirely. Our treatment program, which has given improved results and accelerated recovery of function in patients with paralysis, is based routinely on resistive exercise from the beginning, discarding the gradual progression in intensity of neuromuscular activity. It is based on mass movement patterns and combinations of mass movement patterns, discarding almost entirely isolated muscle therapy. It is based on an intensive program for the greatest activity in treatment in the course of each day, disregarding fatigue as much as possible. It is based on utilization of stretch as an effective facilitation technic, instead of avoiding stretch of the paralyzed muscles. It is based on achieving

From the Kabat-Kaiser Institute, Vallejo, California.

* Read at the Annual Conference of the American Physical Therapy Association, Philadelphia, June 1952.

the maximal response in the muscles with each effort, utilizing summation of technics of proprioceptive facilitation, including maximal resistance, mass movement patterns, reflexes, stretch, and reversal of antagonists. There has been no evidence that this maximal intensive program has resulted in an increase in paralysis in any affected muscles but on the contrary, has greatly improved recovery of motor function.

In the older treatment routine, there is great concern to avoid fatigue. This is based on the idea that fatigue of paralyzed muscles is harmful and results in increase in paralysis. In the new intensive proprioceptive facilitation therapy program, this concept has been thoroughly disproved. Carrying on maximal activity of paralyzed muscles for many hours each day has in no case led to increase in paralysis in any muscles. On the contrary, experience in several thousand cases under the new regime has shown that restoration of motor function is greatly increased and accelerated. Neuromuscular fatigue in voluntary motion is primarily a central phenomenon, and involves the myoneural junction and the muscle to a lesser extent. Fatigue is reversible and a brief rest of the specific motion restores its responsiveness almost completely. Also, there is good evidence that proprioceptive facilitation decreases fatigue, apparently by increasing synaptic excitation. Hellebrandt demonstrated that active recuperation through facilitation is more effective than passive recuperation in overcoming fatigue.

In the performance of a single maximal voluntary motion with facilitation, a mass movement pattern is carried out against manual resistance with appropriate stretch of the muscles, preceded by several reversals of antagonists in the pattern. The mass movement pattern is performed through the range of motion repeatedly until objective fatigue is evident in a somewhat decreased response. Another antagonist contraction is then carried out and the original pattern follows immediately, with restoration of power through facilitation. When objective fatigue cannot be sufficiently overcome by reversal of antagonists to give a satisfactory response, that motion is discontinued. It is not necessary to have the patient rest to recover from fatigue. A different motion is then performed almost immediately with the same routine. Following this, the original motion may be repeated, and it is observed that relatively complete recovery from fatigue has already occurred. A specific exercise may be repeated in this way a number of times in the course of each treatment period, with a good response each time. Valuable therapy time is not wasted by having the patient rest to recover from neuromuscular fatigue, for a brief rest is necessary only for respiratory and circulatory adjustment. The response is always maximal or only slightly diminished, because of facilitation and because the particular exercise is terminated as soon as the response has declined below a satisfactory level as a result of fatigue. In this way, therapy is effective not only in developing power but also in developing endurance.

It is worth considering the origin of the concept that fatigue is harmful and can increase paralysis. It has been a common observation that, if a patient has a very weak anterior tibial muscle and walks without sufficient attention to the gait pattern and continues to walk a good deal when fatigued, that the anterior tibial muscle may test weaker or even zero after several weeks. In this situation, fatigue has undoubtedly contributed to making the paralysis of the muscle worse. However, it is evident that the severely involved anterior tibial muscle fatigues rapidly, and, when the patient continues to walk when fatigued, that muscle is no longer excited in the gait pattern. The patient therefore learns a gait pattern which excludes the anterior tibial, and this muscle is not active in the walking program. If gait is the main activity and inadequate therapy is given the anterior tibial, that muscle will become weaker from disuse. It is very important to distinguish fatigue of the specific paralyzed muscle as a result of activity in therapy, which is beneficial, from fatigue in essential activities and habit training, such as gait, which may be harmful. Also, it must be emphasized that such increase in paralysis of a muscle from fatigue in complex patterns is the result not of excessive activity of that muscle but of its inactivity.

Our routine program of manual resistive exercise for treatment of paralysis is based on summation of a number of facilitation technics in each exercise. In this way, the greatest possible facilitation is achieved with each voluntary effort of the patient. In addition to resistance, a mass movement pattern or combination of mass movement patterns and one of the technics of reversal of antagonists are used routinely. Quite commonly, stretch and a suitable reflex are added to improve the response in the exercise.

Application of proprioceptive facilitation technics for maximal response has made it possible to stimulate dormant neurons which have a high threshold of excitation. These nerve cells are more difficult to activate and are never reached

by less effective routines of treatment. In this way, recovery from paralysis is much more complete, since potential power of the dormant motor units is added to the manifest muscle function remaining. In other words, with proprioceptive facilitation, we not only teach the paralyzed patient to use what he has left but we also develop much potential power which would otherwise remain untapped. Recovery of dormant neurons is illustrated most strikingly by development of useful function in zero muscles; however, dormant power can be uncovered as well in many partially paralyzed muscles.

Some patients who had remained paralyzed for many years and had been considered beyond hope of further recovery have benefited significantly from proprioceptive facilitation therapy. The powerful excitation available through these new technics has made possible dramatic restoration of function in zero and other muscles in patients who had been paralyzed for as long as forty years. This demonstrates that motor nerve cells which had been dormant and completely inactive for many years may still be anatomically intact and potentially capable of function. Such a deeply buried potential can only be unearthed by the powerful bombardment of nerve impulses attained through proprioceptive facilitation.

All of the technics of proprioceptive facilitation increase excitation in the motor centers and pathways in the central nervous system, and particularly at the synapses on the anterior horn cells in the spinal cord. This increase in excitation centrally is brought about by a large increase in the proprioceptive afferent impulses discharging into the motor centers. The increase in excitation at the synapses on the anterior horn cells results in a greater motor response in the muscle by causing more motor units to discharge, by increasing the frequency of motor nerve impulses, and by decreasing central fatigue. Daily repetition of the proprioceptive facilitation technics of therapeutic exercise reduces synaptic resistance and develops functional central pathways for voluntary motion and for habit patterns through training much more rapidly than with the less intensive treatment routine. The beneficial effects on the muscle, such as hypertrophy and improvement in chemistry, circulation, and mechanical characteristics, is an automatic result of the greater motor neuron stimulation, since motor units function "all-or-none."

Technics of proprioceptive facilitation for treatment of paralysis are based on sound fundamental investigation of the physiology of the nervous system. Sherrington demonstrated, many years ago, that eliminating the inflow of all afferent impulses from a limb rendered that limb useless and entirely incapable of voluntary motion. In spite of the complete paralysis of voluntary motion in that limb, electrical stimulation of the motor cortex produced a normal motor response in the extremity. This demonstrated the great importance of proprioception, which Sherrington considered the afferent arc of voluntary motion. Sherrington's investigations on the action of antagonistic muscles, particularly his principle of "successive induction," are the basis for facilitation through technics of reversal of antagonists.

In recent years, Gellhorn and his co-workers have demonstrated the facilitation of motor response on electrical stimulation of the motor cortex in the monkey from application of resistance, stretch and mass movement patterns. They proved that this facilitation effect occurred as a result of proprioceptive mechanisms. They showed that threshold electrical stimulation of the motor cortex results not in an isolated motion but in a mass movement pattern. Such mass movement patterns of a limb in response to electrical stimulation of the motor cortex in the monkey are essentially similar to the mass movement patterns which we have applied as facilitation technics in therapy. They also showed that, while there was no response in the muscle, with subthreshold cortical stimulation when the extremity could move freely, stimulation of the same point with the same electrical current produced a significant response in the muscle on application of stretch and resistance. This observation is comparable to our finding in patients with paralysis that so-called "zero" muscles which did not respond in assistive or free motion, showed a definite response when proprioceptive facilitation technics were applied. Recent studies by Hellebrandt and her co-workers on the work output in unilateral and in bilateral exercise showed that central facilitation can decrease fatigue.

These experiments demonstrate the powerful facilitating effect of proprioceptive mechanisms on the corticospinal tract. Our observations indicate that not only the motor cortex but also the spinal cord and subcortical motor centers, including the cerebellum, can be excited through proprioceptive facilitation technics to accelerate recovery of function in paralysis. The fact that spinal reflexes such as the stretch reflex, the mass flexion reflex, and positive supporting reaction, can increase the voluntary motor response indicates facilitation at the spinal level. Facilitation

at the brain stem level is suggested by the increased response in voluntary motion from application of postural reflexes and balancing patterns. There is suggestive evidence that the cerebellum is stimulated in the facilitation technic of isometric reversal of antagonists, which we have designated "rhythmic stabilization." There is reason to believe that all of the motor centers and pathways in the brain and spinal cord may be excited by one or another of the proprioceptive facilitation technics. By repeated excitation of subcortical motor centers through persistent therapy, new functional pathways for voluntary motion can be developed gradually to substitute for a deficient corticospinal mechanism.

Investigation of proprioceptive facilitation technics for a number of years and their application in thousands of cases of paralysis of various types at the Kabat-Kaiser Institutes have demonstrated the practical value of these technics in the treatment of paralysis. This treatment program is, in our opinion, definitely superior to the older routine of treatment. Proprioceptive facilitation technics require specialized training, considerable skill and experience, as well as close and competent medical supervision. By harnessing the powerful fundamental mechanisms in the central nervous system for proprioceptive facilitation, these technics provide a new and powerful tool for overcoming paralysis.

TECHNICS OF PROPRIOCEPTIVE FACILITATION

I. Maximal Resistance

The generally accepted program of neuromuscular reeducation places great emphasis on avoidance of excessive activity with much of the time spent in passive and assistive exercise and with concentration on avoidance of fatigue. This technic fails to activate all of the available motor units of the muscle and is therefore not fully effective in the therapy of paralysis. Electromyographic studies of normal and paralyzed muscles reveal a marked increase in the number of active motor units in the muscle when voluntary contraction takes place against resistance as compared to assistive motion or even free motion against gravity. Some muscles hardly respond at all until resistance is applied. Without denying the importance of passive motion as a therapeutic measure to increase range of joint motion, it must be recognized that passive motion accomplishes nothing directly in improving function of paralyzed muscles since no voluntary activity is induced in the motor units. In assistive motion, only a small percentage of all the motor units of the muscle is active in a single effort. Since the activity of the motor units is responsible for the therapeutic effect of the exercise, what conceivable advantage can there be in keeping the majority of the motor units in the muscle inactive in such a therapeutic program? It is evident that one is not sparing the muscle from excessive activity by using assistive motion since all of the active motor units contract maximally (all-or-none). The inactive motor units are not responding at all and are therefore not receiving treatment. Furthermore, repetition of assistive motion would activate the same small group of motor units each time since these are the units which have the lowest threshold of excitation. Even free motion with gravity eliminated and in many instances free motion against gravity excite a relatively small proportion of the motor units in the muscle. Only after application of maximal resistance do a large proportion of the motor units respond.

It is well established that resistance increases the response of muscles in voluntary contraction. This observation is common knowledge to weight lifters who use maximal resistance to build up muscle power and bring about hypertrophy. While resistive exercise through the use of weights is not new, DeLorme and Watkins have made a significant contribution in placing emphasis upon it as a treatment procedure. The use of weights, pulleys, friction, antigravity exercises and similar technics are valuable as methods of applying resistance and are used routinely in our treatment program. Resistive exercise is also prescribed in occupational therapy. On the other hand, we have found that manual resistance allows the greatest range of technical procedures for facilitation and is essential for effective treatment of paralysis.

The greatest flexibility in application of resistive exercise is afforded by individual treatment by a skilled physical therapist. The therapist can combine a variety of powerful facilitating technics with resistance in order to obtain a greater response in voluntary contraction of weakened, paralyzed, and even "zero" muscles. Resistance can be varied through the range of motion exactly as needed to maintain a maximal contraction throughout the range. The therapist can also assist the patient to increase active range of motion by taking the joint beyond his active range and having him make a facilitated maximal isometric contraction. Manual resistance is also essential for guidance of the voluntary motion in the proper direction and elimination of substitution. Individual physical therapy is required for

strengthening only the weaker antagonists to correct muscle imbalance. In addition to application of resistance for fundamental neuromuscular reeducation, the therapist can also accelerate training of essential patterns such as sitting balance, standing balance, and balance on crutches by applying resistance in these more complex patterns. A close personal relationship is also developed between the patient and the therapist in the daily treatment periods and for this reason the therapist can elicit greater effort, concentration and cooperation.

While the effect of resistance in increasing the response of muscles in voluntary contraction is widely known and accepted without question, the physiologic mechanism involved has received little attention. In their recent book on progressive resistance exercise, DeLorme and Watkins merely mention that resistance induces proprioceptive stimulation and present no thorough discussion of the fundamental physiologic mechanism of resistance.

Recently, experiments in monkeys by Gellhorn have thrown considerable light on the mechanism of resistance. He was able to show that when a point on the motor cortex was stimulated to produce contraction in a particular muscle, the strength of the response was relatively slight when the joint was allowed to move freely as compared to the response obtained when the joint was fixed. Fixation of the joint in his experiments constituted resistance and he demonstrated that the mechanism of resistance was through proprioceptive stimulation by the increased tension in the muscle. Although a subthreshold electrical stimulus to the motor cortex point failed to bring about any discharge when the joint was allowed to move freely, the same stimulus elicited a contraction in the muscle when resistance and stretch were applied. He demonstrated in this way that cortical stimulation which was too weak to reach threshold level by itself could be strengthened by proprioceptive stimulation from the muscle to raise the level of excitation above threshold. To quote his paper: "The effects seem to be based on the interaction of the proprioceptive impulses with those elicited by cortical stimulation, resulting in an increased number of discharging motor units."

Further evidence that the proprioceptive impulses from the muscle are responsible for the facilitation of the response to cortical stimulation is the fact that the facilitation effect is eliminated by deafferentation of the limb.

Another factor in the increased response of the muscle against resistance is related to the muscle itself rather than the nervous mechanism. Even in the isolated nerve-muscle preparation on supramaximal nerve stimulation, increased length or increased load enhance the mechanical response of the muscle but not the electromyogram. In voluntary motion or cortical stimulation, proprioceptive facilitation, resulting in a greater number of functioning motor units, is a much more important factor in the increased muscular contraction resulting from resistance and stretch than is the direct effect on the muscle itself.

II. Stretch

In many patients with paralysis, resistance applied to the shortened muscle may be relatively ineffective while resistance applied to the stretched muscle elicits a stronger response. This is especially true in flaccid paralysis as in poliomyelitis. Rapid stretch is particularly effective in producing facilitation in such technics as sudden breaking of a hold followed immediately by active motion against resistance. Another method of quick stretch of the muscles is hold, relax, then active motion in rapid sequence.

Not only is stretching effective in facilitating contraction in the stretched muscle but stretch of another muscle which is part of the same mass movement pattern can also produce facilitation of a paralyzed muscle. For example: voluntary contraction of the iliopsoas muscle can be facilitated not only by stretching of the iliopsoas, but also by stretching of the anterior tibial muscle which is associated with the iliopsoas in a total flexion pattern of the lower extremity.

Stretch of an antagonist, particularly if that muscle is spastic, may inhibit both range of motion and facilitation of voluntary contraction of the agonist muscle. Use of a position in which stretch of the antagonist is avoided will allow greater facilitation of the agonist. As an example: contraction of the anterior tibial muscle may be minimal while the patient is supine with the knee extended; yet the same muscle will contract with considerable strength against resistance with the hip and knee flexed. In the more favorable position, stretch of the spastic gastrocnemius is effectively reduced.

On the other hand, stretch of the antagonist may in some instances apparently stimulate a better response of the agonist. We have noted particularly in athetosis that the voluntary contraction in the shortened range of the muscle against resistance is usually greater than in the lengthened range.

Gellhorn demonstrated in the monkey that stretch of a muscle added to resistance further

facilitates the response of this muscle to electrical stimulation of the proper cortical focus. Resistance is a more powerful facilitation mechanism than stretch. The combination of stretch and resistance greatly increases the recruitment of anterior horn cells in response to weak stimulation of the motor cortex: "The magnitude of the intensification is considerable since subthreshold cortical stimulation may be made effective by bringing proprioceptive impulses into play, whereas often even a considerable increase in stimulus intensity fails to cause the same motor effect in the absence of such facilitatory proprioceptive impulses." He also showed that stretch of a synergistic muscle in the mass movement pattern has a facilitating effect on the response of the prime mover to cortical stimulation.

III. Mass Movement Patterns

In the usual routine of treatment of paralysis, great emphasis has been placed on contraction of isolated muscles or performance of single elementary motions such as flexion of the elbow or extension of the wrist. This is believed to be the best method of developing voluntary control through neuromuscular reeducation. By concentrating the patient's attention and effort on a single muscle or elementary motion it is felt that more effective recovery from paralysis results.

For a number of years, we have been convinced that the procedure of treatment of isolated muscles or isolated motions is relatively ineffective and unsound. A single muscle or an isolated individual motion is practically never used in the performance of voluntary activities. Furthermore, powerful facilitation of the voluntary response of a paralyzed muscle can be brought about through performance of a mass movement pattern of an entire extremity against resistance. In a particular patient, the anterior tibial muscle which fails to respond at all in free motion or against resistance in an isolated motion, may definitely contract when the patient performs a mass flexion pattern of the entire lower extremity against maximal resistance. This facilitation only occurs if the hip and knee flexors respond with sufficient power to overflow innervation to the paralyzed anterior tibial. However, if the hip and knee flexors were also severely paralyzed, facilitation of the anterior tibial muscle from this procedure would not ensue. The mechanism of overflow of excitation to a paralyzed muscle in a mass movement pattern is apparently similar to irradiation in reflexes.

The facilitation in a mass movement pattern can occur not only through overflow from functioning proximal muscles to paralyzed distal muscles in the extremity but also in the reverse direction. A relatively strong anterior tibial muscle can facilitate a paralyzed iliopsoas muscle when the mass flexion pattern is performed against maximal resistance. As mentioned previously, stretch of synergistic muscles in a mass movement pattern is also an effective facilitation mechanism. Because of the great value of the facilitation produced by mass movement patterns, we have discarded to a large extent exercise of individual motions and routinely use mass movement patterns in the therapy of paralysis.

Primitive complex patterns of motion are used routinely in normal activities requiring great effort in work and sports. Examples include: chopping wood, running, using a shovel, throwing a ball, swimming and pulling up weeds. Careful analysis of these motions reveals that the direction of the motion is not straight, but is diagonal and spiral. This probably corresponds to the anatomical distribution of the muscles in the pattern for the application of the greatest power. We have found that diagonal, spiral mass movement patterns are usually more effective in facilitation than straight mass movement patterns. For example, greater facilitation of a paralyzed peroneal muscle can be achieved by overflow from a diagonal spiral pattern of extension, abduction, internal rotation of the hip against resistance, than from a pattern of straight abduction of the hip. An example of a diagonal mass movement pattern of the upper trunk is: flexion, lateral motion and rotation of the neck and upper trunk to the right, with extension, adduction, internal rotation of the left shoulder. This is a motion of rolling over to the right from the supine position, in an adversive movement. A diagonal spiral pattern of the lower extremity is: flexion, abduction, external rotation of the hip; flexion of the knee; dorsiflexion, inversion of the ankle and extension of the toes. An example of the upper extremity is: flexion, abduction, external rotation of the shoulder; extension of the elbow, supination; radial extension of the wrist and opening of the hand.

Frequently, a combination of mass movement patterns produces greater facilitation. If the left hip flexors are much stronger than the right, the affected right hip flexors will show a stronger response from bilateral asymmetrical mass flexion patterns of the lower extremities than from flexion of the right leg alone. In this way, bilateral symmetrical, asymmetrical and reciprocal mass movement patterns of upper or lower extremities may be effective in facilitation. The

response of a paralyzed muscle in the lower extremity may also be augmented by a combination of mass movement patterns of the leg with the stronger opposite arm in a primitive running pattern.

Instead of treating severely paralyzed and "zero" muscles in the usual way with assistive isolated motion yielding little or no response, such muscles are treated in our program routinely against resistance with a variety of facilitation technics including overflow from less involved muscles in a mass movement pattern or combination of patterns. Whereas the usual physical therapy program is devoted almost exclusively to the more involved muscles, our facilitation program devotes a good deal of attention to the less involved muscle groups as well. But in this process, rather than neglecting the more severely paralyzed muscle groups, these muscles recover function much more rapidly because their response is facilitated. Also, coordinated patterns which can carry over directly into practical activities are developed more effectively. Another significant advantage of mass movement patterns is that a large number of muscles is exercised at one time so that the therapist can accomplish much more in each treatment period than when isolated individual motions are performed.

Mass movement patterns are prescribed not only in manual resistive exercise in daily individual physical therapy periods, but these patterns are also applied in the gymnasium. Mass movement patterns and combinations are carried out against the resistance of pulleys, dumbbells or weighted boots. Primitive natural patterns are also applied in mat work in activities such as crawling, rolling over, sitting up and antigravity exercises. Resistive exercise in mass movement patterns has also proved useful in many cases in occupational therapy.

From extensive observations on a large number of patients with neuromuscular disorders, it is apparent that even in patients with severe paralysis from various lesions, such as of the corticospinal tracts, anterior horn cells, or cerebellum, the mass movement patterns are still relatively undisturbed. The patterns are also demonstrable in patients with Parkinson's disease. Of all types of paralysis studied, the only patients who showed disruption and disturbance of the mass movement patterns were those with athetosis.

Inman, Saunders, and Abbott were impressed by the importance of patterns of motion for muscle reeducation: "There is, for example, no such thing as a prime mover, as ordinarily understood. There are only patterns of action. This conception extends and amplifies the axiom laid down by Beevor when he said with regard to the brain that it knows nothing of the action of the individual muscles, but only of movement. . . . Sampling of various portions of an individual muscle shows that they can act independently, but synchronously in association with the total pattern of a specific movement. This great principle is absolutely fundamental for establishing rational procedures of muscle reeducation. These patterns of muscular activity cannot be reduplicated by voluntary contraction of the muscle alone. They can only be brought into play by carrying out the precise motion itself, which probably brings into play proprioceptive mechanisms. . . . Motion, and motion alone, is the only known stimulus able to engender, in phase and degree, the muscle activity requisite for the establishment of the pattern as a whole."

The fundamental nature of mass movement patterns in the functioning of the nervous system is demonstrated by a variety of scientific evidence. Coghill concluded, from investigations of the development of amblystoma, that the earliest movements are perfectly integrated total patterns, within which partial patterns later arise as the basis of more discrete movements. In the human fetus and developing infant, coordinated mass movement patterns are also prominent in motor behavior. Hellebrandt observed mass movement patterns in normal adults as a result of irradiation from isolated motion against maximal resistance, and as a result of fatigue. In a careful study of recovery of function in hemiplegic patients, Twitchell noted that the first movements were mass patterns of synergistic flexor or extensor muscle groups of the entire limb, from which more isolated motions were developed as recovery progressed.

Gellhorn presents conclusive evidence that mass movement patterns are excited by electrical stimulation of a single point on the motor cortex. In a recent paper, he pointed out: "Stimulation of the motor cortex in anesthetized monkeys (Macacus rhesus) under threshold conditions . . . shows that not single muscles or parts of muscles are activated but muscle groups which are functionally interrelated. Such grouped muscle activity which seems to be the basis of coordinated movement is induced in a similar manner from all parts of the motor cortex on threshold stimulation. No essential differences were found between areas 4 and 6 in this respect." In other words, the response to very weak

electrical stimulation of an individual focus in the motor cortex is in a synergistic pattern of muscles at more than one joint, rather than a single muscle or single motion. In another paper, Gellhorn demonstrated that proprioceptive impulses induced by resistance and stretch become effective in facilitating the response to cortical stimulation not only in the stretched and resisted muscle but throughout the mass movement pattern: "In addition, proprioceptive impulses thus induced become effective, although to a lesser extent, in those muscles with which the proprioceptively excited muscle forms specific functional associations. . . . For instance, proprioception originating in the biceps increases also the reactivity of the extensor carpi to cortical stimulation; similar relations exist between triceps and hamstrings; hamstring and anterior tibial muscle. It was shown also that this effect occurs in the opposite direction within these complexes. For example, fixation of the wrist in ventroflexion increases the reactivity to cortical stimulation not only of the extensor carpi but also the biceps muscle."

In a more recent paper, Gellhorn and Johnson observed that stimulation of an individual focus of the motor cortex in the monkey excites a highly specific mass movement pattern of the entire limb. In these experiments, the patterns of the fore-limb were investigated more thoroughly: "The biceps complex was found to consist largely of the flexors of the elbow, the extensors of wrist and fingers and acromiodeltoid muscle, while the triceps complex comprised, in addition to the extensors of the elbow, the flexors of the wrist and fingers and most of the shoulder muscles with the exception of the acromiodeltoid muscle." These patterns were facilitated by proprioceptive stimulation through stretch and resistance.

Our observations on facilitation of voluntary motion in patients with paralysis were made independently of Gellhorn's experiments on facilitation of the response to electrical stimulation of the motor cortex in monkeys. It is apparent, however, that the demonstrated facilitation mechanisms are essentially similar in the monkey and in man. The striking facilitation effect induced by stretch and resistance in patients is identical to that in the monkey experiments. The specific synergistic patterns of an entire limb as demonstrated in the fore-limb of the monkey through electrical stimulation of the motor cortex are similar to the mass movement patterns which we have found useful as a powerful facilitation mechanism for the upper extremity in patients. Both Gellhorn's experiments and our observations confirm the fact that the mass movement patterns are equally effective in a distal-to-proximal as in a proximal-to-distal direction.

IV. Reflexes

A number of reflexes can be utilized as facilitation technics. The procedure is to stimulate the reflex and perform voluntary motion against resistance in the same muscle group simultaneously and use the reflex excitation to facilitate the voluntary neuromuscular response. The reflex stimulus must be weak enough so that the voluntary component of the response is as great as possible. The reflex may be stimulated continuously while the voluntary component is alternately contracted and relaxed. Also, the period of after-discharge of the reflex may be utilized in combination with voluntary motion against resistance.

Besides the simple stretch reflexes discussed above, other proprioceptive reflexes are of value as facilitation technics in treatment of paralysis. These include the postural and righting reflexes such as the tonic neck reflexes of Magnus and vestibular reflexes. Another example is the positive supporting reaction which is the extensor thrust elicited by pressure stimulation on the plantar surface of the foot. In carrying out therapy for sitting balance, kneeling balance, and standing balance against resistance, large complex patterns of muscular response are excited with facilitation from postural and righting reflexes. Other reflexes which can facilitate voluntary effort to increase contraction in paralyzed muscles include the mass flexion reflex of the lower extremity (von Bechterew reflex), and gag reflex.

Loofbourrow and Gellhorn demonstrated that activity in the same functional associations of muscle groups in patterns is induced by stimulation of stretch reflexes of the muscles as is produced by electrical stimulation of the motor cortex. From this they reason that the same mechanism may play a role in voluntary motion and in simple proprioceptive reflexes. In another paper, the same authors showed that reflexes produced by electrical stimulation of afferent nerves brought about responses in the identical patterns of specific synergistic muscle groups. The motor responses in the patterns in these reflexes were facilitated by stretch and resistance in a manner similar to the proprioceptive facilitation observed in experiments on cortical stimulation.

V. Reversal of Antagonists

In the performance of many activities in work and sports, the antagonist motion is carried out

immediately preceding the main action. For example: in pitching a baseball, the arm is first brought back, the trunk rotated and the opposite leg raised and then, in a continuous sequence without interruption, the ball is thrown. The antagonist motion precedes the action in chopping wood, the golf swing, kicking a football, using a scythe, and many other activities. The contraction of the antagonist against resistance immediately preceding resistive exercise of the agonist is a valuable technic of facilitation. The stronger the contraction of the antagonist, the greater the facilitation of the agonist muscle. This technic is particularly effective when the agonist is paralyzed and the antagonist is relatively uninvolved. Reversal of antagonists is usually applied in mass movement patterns against maximal resistance, and the cortical stimulus can be strengthened with other facilitation technics. Frequently, repeated reversal of antagonists builds up greater facilitation, and is followed by repeated resistive exercise of the agonist pattern. When fatigue of the agonist pattern sets in, another reversal of antagonists helps to overcome the fatigue and restore effective facilitation.

The facilitating effect of rapid alternating contraction of antagonistic muscle groups against maximal resistance can be applied in a number of specific technics:

a. *Rhythmic stabilization.* This is a technic of rapid alternation of isometric contraction of antagonists against maximal resistance. The patient attempts to hold a rigid position of a joint and the therapist alternates maximal resistance in one plane in an attempt to move the joint. As an example: the patient holds the wrist rigid in the neutral position and the therapist rhythmically applies resistance alternately to the radial extensor, then the ulnar flexor, then radial extensor, etc. After the patient alternates isometric contraction of the antagonist muscles, the power of contraction of the muscles increases following which maximal isotonic contraction of the agonist is performed repeatedly against resistance. Rhythmic stabilization is carried out in mass movement patterns and supported by other facilitation technics for greater response.

Rhythmic stabilization is effective as a facilitation technic in patients with lower motor neuron lesions, lesions of the corticospinal tracts and basal ganglia. On the other hand, patients with cerebellar involvement fail to show facilitation from this technic and even fail to perform rhythmic stabilization successfully.

b. *Isotonic reversal of antagonists.* In this method, alternating active motion of the antagonists is carried out against maximal resistance. This procedure can be performed using the entire range of joint motion or using a part of the range. This technic is applicable in all types of paralysis.

c. *Isotonic reversal of antagonists with isometric contraction.* In this facilitation method, the patient performs isotonic contraction of the antagonist through the range, then isometric contraction of the antagonist in the shortened range, followed immediately by active motion of the agonist through the range succeeded by holding with the agonist. The technic is carried out against maximal resistance and usually repeated alternation of antagonistic muscle contractions is performed.

d. *Quick reversal of antagonists.** In this technic of facilitation of voluntary motion, active motion of the antagonist is carried out throagh the range rather slowly against maximal resistance, then suddenly the motion is reversed and the agonist is contracted and assisted as rapidly as possible to the shortened position, immediately following which there is an isometric contraction of the agonist against maximal resistance.

One of the fundamental principles of functioning of the reflex centers in the spinal cord is successive induction. If the flexion reflex is carried out in a spinal animal, immediately afterward the excitability of the antagonist response, the extension reflex in that limb, is considerably increased. In other words, the previous activity in the antagonist centers is followed immediately afterward by a period of facilitation of the agonist pattern. The principle of successive induction is also applicable to voluntary motion and is related to facilitation through reversal of antagonists.

While the response to weak cortical stimulation is contraction of the agonist with inactivity of the antagonist muscle group, co-contraction results from increased intensity of cortical stimulation as well as from strong proprioceptive facilitation of a weak cortical stimulus. In co-contraction, both antagonists contract simultaneously wtih stronger contraction of the agonist group. In therapeutic exercise with maximal facilitation of the motor response, co-contraction would frequently occur and with this background of simultaneous excitation in both antagonists, alternation of antagonists should increase facilitation. When the agonist is resisted, the antagonist would be in a state of partial contraction and heightened

* This technic was first suggested by one of our physical therapists, Miss Luba Brisker.

excitability. When the resistance is reversed and suddenly applied to the antagonist, the resistance would induce a stronger proprioceptive stimulus because the antagonist muscle is already partially contracted rather than flaccid. Furthermore, the facilitation of the antagonist is favored by the previous excitation of this muscle in co-contraction. This facilitation should build up higher with each reversal of the antagonists, for a time. Such a progressive increase in facilitation with repeated reversal of antagonists does in fact occur. In addition, in isotonic reversal of antagonists carried through the range of motion, not only would the proprioceptive stimulation from resistance be greater, but the muscle would also be on maximal stretch at the moment of reversal of the antagonists.

SUMMARY

I. The usual routine of neuromuscular reeducation for paralysis is based on:
   a. Gradual progression from passive and assistive motion to free motion, free motion against gravity and finally resistive motion.
   b. Isolated muscles or motions.
   c. Avoidance of fatigue.
   d. Avoidance of stretch of the muscles.

II. This routine is shown to be relatively ineffective and physiologically unsound and should be discarded.
   a. 1. Assistive motion excites only a small proportion of the available motor units.
      2. Many motor neurons with a high threshold of excitation are never stimulated by this procedure.
      3. Dormant anterior horn cells in "zero" or severely paralyzed muscles can only be excited when maximal proprioceptive facilitation is utilized.
      4. With effective proprioceptive facilitation, maximal resistance can be applied from the beginning of the therapy program.
      5. Various technics of proprioceptive facilitation can only be applied effectively in resistive exercise.
   b. 1. Isolated muscles are practically never used in coordinated movement.
      2. Irradiation to synergistic muscles is a natural and automatic result of effective muscle contraction, such as is produced by resistive exercise.
      3. Powerful facilitation by mass movement patterns and combinations of mass movement patterns are unavailable when isolated motion is attempted.
      4. Natural patterns of coordinated movement are more effectively trained by performance of mass movement patterns against resistance.
      5. Economy of therapy time is effected by contraction of many muscle groups with a single effort.
   c. 1. Fatigue is primarily central and is rapidly reversible.
      2. Intensive treatment of paralysis, with maximal activity for many hours each day, does not increase paralysis but leads to more rapid and more complete recovery of motor function.
      3. Intensive treatment, disregarding fatigue as much as possible, permits more effective restitution of endurance and allows more time for training of essential motor patterns and skills.
      4. Fatigue results in irradiation to synergistic muscle groups, preventing isolated motion.
      5. Proprioceptive facilitation is effective in decreasing fatigue through "active recuperation."
      6. Fatigue of voluntary contraction of specific muscles is beneficial while fatigue in training patterns and skills such as gait, with inadequate supervision, may be harmful.
   d. 1. Stretch is an effective method of proprioceptive facilitation in resistive exercise.
      2. Proper utilization of stretch of the muscles in facilitation does not lead to increased paralysis but rather enhances motor recovery.
      3. Facilitation through stretch, strengthened with other technics of proprioceptive facilitation, decreases rather than increases flaccidity.
      4. Passive stretch alone without effective restoration of motor function can weaken and increase flaccidity of the stretched, paralyzed muscle.
      5. Stretch of synergists in the mass movement pattern also facilitates the motor response.

III. a. In the proprioceptive facilitation program of neuromuscular reeducation for paralysis, the following technics are applied routinely:

1. Maximal resistance.
2. Stretch.
3. Mass movement patterns.
4. Reflexes.
5. Reversal of antagonists.

The technics, their variations and rationale are discussed in detail. These methods of proprioceptive stimulation are strengthened to produce a maximal response with each effort.

b. Intensive activity is carried out for a number of hours each day, disregarding fatigue as much as possible.

c. Strong excitation of the available motor units through proprioceptive facilitation results automatically in beneficial effects on the muscle tissue, since the muscle fibers of the motor unit contract "all-or-none" to the discharge of the anterior horn cell.

d. Daily repetition of strong excitation of the central motor mechanisms through proprioceptive facilitation results in more rapid and effective decrease in synaptic resistance. This accelerates development of new pathways in the central nervous system for coordinated voluntary motion and for essential habit patterns and motor learning.

IV. Technics of proprioceptive facilitation for therapy of paralysis have a sound fundamental basis in neurophysiology. They are based on the monumental work of Sherrington on the functioning of the reflex centers, the role of facilitation and summation in central excitation, the mechanism of successive induction, and the importance of proprioception in voluntary movement. More recently, Gellhorn has investigated the fundamental mechanisms of proprioceptive facilitation in monkeys. He has demonstrated the same facilitation effects on the response to electrical stimulation of the motor cortex in the monkey from resistance, stretch and mass movement patterns as we have found in voluntary motion in patients with paralysis. The physiologic mechanisms of proprioceptive facilitation have also been clarified by the scientific studies of Coghill, McGraw, Gesell, Inman and others, and more recently by Hellebrandt and Twitchell.

Application of proprioceptive facilitation technics in treatment of paralysis is based to a large extent on the tremendous contributions of Pavlov on the mechanisms of learning and formation of habit patterns.

REFERENCES

1. Kraus, H.: Principles and Practice of Therapeutic Exercise, Charles C. Thomas, Springfield, Ill., 1949.
2. DeLorme, T. L., and Watkins, A. L.: Progressive Resistance Exercise — Technic and Medical Application, Appleton-Century-Crofts, Inc., New York, 1951.
3. Kabat, H.: Studies on Neuromuscular Dysfunction, XI: New Principles of Neuromuscular Reeducation, Permanente Foundation Med. Bull., 5:3; 111-123 (Nov.) 1947.
4. ———: Studies on Neuromuscular Dysfunction, XII: Rhythmic Stabilization; A New and More Effective Technic for Treatment of Paralysis through a Cerebellar Mechanism, Permanente Foundation Med. Bull., 8:1; 9-19 (Jan.) 1950.
5. ———: Studies on Neuromuscular Dysfunction, XIII: New Concepts and Techniques of Neuromuscular Reeducation for Paralysis, Permanente Foundation Med. Bull., 8:3; 121-143 (July) 1950.
6. ———: Central Mechanisms for Recovery of Neuromuscular Function, Science, 112:23-24 (July 7) 1950.
7. ———: Studies on Neuromuscular Dysfunction, XIV: Restoration of Voluntary Motion and Sensation through Neuromuscular Reeducation in Apparently Complete Traumatic Paraplegia, Permanente Foundation Med. Bull., 9:2 and 3; 86-103 (July) 1951.
8. ———: Restoration of Function through Neuromuscular Reeducation in Traumatic Paraplegia, Arch. Neurol. & Psychiat., June, 1952.
9. ———: Studies on Neuromuscular Dysfunction, XV: The Role of Central Facilitation in Restoration of Motor Function in Paralysis, Arch. Phys. Med. (In press).
10. Huddleston, O. L.: Use of an Intensive Physical Medicine Program in the Rehabilitation of Convalescent and Chronic Anterior Poliomyelitis Patients, Arch. Phys. Med. (In press).
11. Hellebrandt, F. A., Houtz, S. J., and Eubank, R. N.: Influence of Alternate and Reciprocal Exercise on Work Capacity, Arch. Phys. Med., 32-766-777 (Dec.) 1951.
12. Mott, F. W. and Sherrington, C. S.: Experiments upon the Influence of Sensory Nerves upon Movement and Nutrition of the Limbs, Proc. Roy. Soc., 57:481-488, 1895.
13. Gellhorn, E.: Proprioception and the Motor Cortex, Brain, 72:35-62, 1949.
14. Hyde, J., and Gellhorn, E.: Influence of Deafferentation on Stimulation of Motor Cortex, Am. J. Physiol., 156:311, 1949.
15. Gellhorn, E.: Validity of the Concept of Multiplicity of Representation in the Motor Cortex under Conditions of Threshold Stimulation, Brain, 73-268, 1950.
16. Gellhorn, E., and Johnson, D. A.: Further Studies on the Role of Proprioception in Cortically Induced Movements of the Foreleg in the Monkey, Brain, 73:513, 1950.
17. Levine, M., and Kabat, H.: Proprioceptive Facilitation of Voluntary Motion in Man, J. Nerv. and Ment. Dis. (In press).
18. Kabat, H., and Rosenberg, D.: Concepts and Techniques of Occupational Therapy for Neuromuscular Disorders, A. J. Occupational Therapy, 4:6-11 (Jan., Feb.) 1950.
19. Loofbourrow, G. N.: Electrographic Evaluation of Mechanical Response in Mammalian Skeletal Muscle in Different Conditions, J. Neurophys., 11:153, 1948.
20. Fulton, J. F.: Physiology of the Nervous System, Oxford University Press, New York, 1943.
21. Haller, J. S., and Gurewitsch, A. D.: An Approach to Dynamic Posture Based on Primitive Motion Patterns, Arch. Phys. Med., 31:632, 1950.
22. Inman, V. T., Saunders, J. B., and Abbott, L. C.: Observations on the Function of the Shoulder Joint, J. Bone & Joint Surg., 26:1-30, 1944.
23. Coghill, G. E.: Anatomy and the Problem of Behavior, Cambridge, The University Press, 1929.
24. McGraw, M. B.: The Neuromuscular Maturation of the Human Infant, New York, Columbia University Press, 1943.
25. Gesell, A.: The Embryology of Behavior, New York, Harper and Brothers, 1945.

26. Hellebrandt, F. A.: Physiology of Motor Learning as Applied to the Treatment of the Cerebral Palsied. Quarterly Review of Pediatrics, 7:5 (Feb.) 1952.
27. Twitchell, T. E.: The Restoration of Motor Function following Hemiplegia in Man. Brain 74:443, 1951.
28. Loofbourrow, G. N. and Gellhorn, E.: Proprioceptively Induced Reflex Patterns. Am. J. Physiol., 154:433, 1948.
29. Loofbourrow, G. N., and Gellhorn, E.: Proprioceptive Modification of Reflex Patterns. J. Neurophysiol., 12: 435-446, 1949.

Electrical Stimulation in Serratus Anterior Paralysis (Winged Scapula)

J. L. Rudd, M.D.

Introduction.

The difficulty in securing a good contraction of the serratus anterior (magnus) muscle in the axillary area usually recommended for the testing and the treatment of paralysis of this muscle is well known. Stimulation at the axillary site (see figure 1) is compared to an area in the posterior triangle of the neck (see figure 1) where the long thoracic nerve, arising from the fifth, sixth and seventh cervicals and lying on the scalenus medius is found to give a more favorable response to the electrical current.

The testing or treating electrode is applied under and deep to the anterior edge of the trapezius muscle. This point is above the clavicle and not far lateral to Erb's point (a point 2-3 cm. above the clavicle and outside the posterior border of the sternomastoid, at the level of the transverse process of the sixth cervical vertebra).

A typical case in which the long thoracic nerve of Bell was involved will be presented and discussed, as an example, to indicate the improvement in the ability to elicit a response of the paretic serratus anterior (magnus) muscle. This patient, who had received an injection of tetanus antitoxin resulting in an acute radiculomyelitis, was treated and tested both in the axillary and in the posterior triangle areas of the neck.

Anatomy.

The serratus magnus muscle arises from digitations on the outer and superior borders of the upper eight or nine ribs and from an aponeurosis covering the intercostal muscles. The upper three ribs send digitations to the superior angle of the scapula, whereas the lower five ribs send digitations to the inferior angle. The upper three digitations draw the scapula forward, increasing the reach of the outstretched hand. The lower five digitations steady or pull forward the inferior angle when the arm is raised in front of the body. The muscle inserts into the ventral surface of the vertebral border of the scapula, the lower five or six digitations converge and insert on the ventral surface of the inferior angle of the scapula.

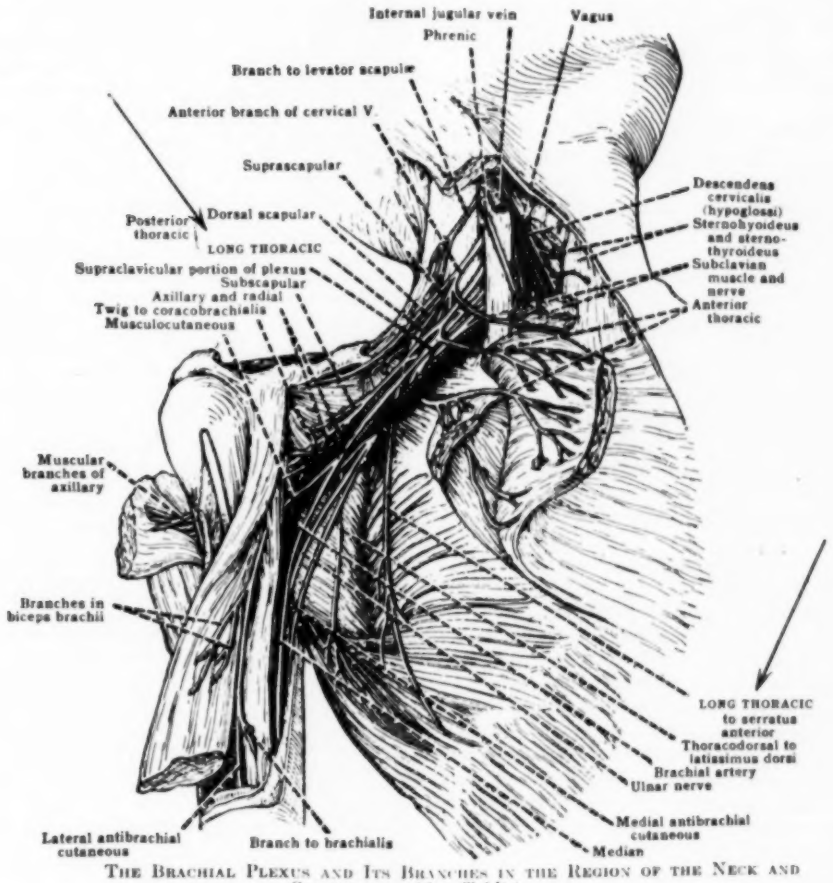
The long thoracic nerve, external respiratory nerve of Bell, arises by three roots from the fifth, sixth and seventh cervicals. The roots from the fifth and sixth pierce the scalenus medius while the seventh cervical, if it is present, passes in front of the muscle. The long thoracic nerve later descends from above the clavicle in the groove between the sternomastoid and the trapezius to behind the brachial plexus and the axillary vessels, downward on the serratus anterior muscle in the axilla. In its location in the posterior triangle of the neck it is bordered above and medially by the scalenus anterior muscle and the main mass of the brachial plexus. The levator scapula muscle is lateral to it, the serratus anterior which it supplies lies just below it and the nerve itself, in the posterior neck region, is covered by skin, platysma and a fascial carpet. Although the nerve is fairly deeply situated and hemmed in from all sides an anatomical dissection shows it to be accessible to a stimulating electrode.

The area usually recommended for stimulation of the long thoracic nerve is in the upper axilla between the pectoralis major anteriorly and the latissimus dorsi, posteriorly. This is above and posterior to the origin of the obliquus externus muscle, above the level of the nipple line.

Even when the nerve is normal it is admittedly difficult to get good contractions of the serratus anterior when the more distal branches of the nerve in the muscle are stimulated at the angle

Chief, Physical Medicine Rehabilitation Service, Veterans Administration Hospital, West Roxbury and Boston, Massachusetts.

Sponsored by the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.



THE BRACHIAL PLEXUS AND ITS BRANCHES IN THE REGION OF THE NECK AND SHOULDER. (After Toldt.)

Figure 1.

between the pectoralis major and the latissimus dorsi muscles. To secure better results with less discomfort, stimulation was applied as close to the origin of the nerve as possible in the area where the long thoracic nerve lies on the scalenus medius muscle lateral to the lateral border of the scalenus anterior muscle and not far from where the fifth, sixth and seventh cervicals emerge from the spinal cord. This is above and lateral to Erb's point.

The testing and treating electrode was placed under the anterior edge of the upper fibers of the trapezius muscle. The nerves closest to it which had to be avoided were the dorsal scapular to the rhomboid muscles (which was more lateral), the suprascapular nerve, the bulk of the brachial plexus at Erb's point and the phrenic nerve, all of which were more medially placed.

Pathology.

Paralysis of the serratus anterior muscle results in a protrusion of the scapula from the thoracic wall, a "winged shoulder." It is characterized by the inability to fix the scapula when the arm goes into extension to resist or push against something. If the patient attempts to strike a blow with the fist or tries to bring the scapula forward as in reaching with the hand, or attempts to raise the chest with the scapula fixed, the medial border of the scapula will not remain close to the thoracic cage because of the serratus anterior weakness. The normal action of the muscle is in scapular

abduction and upward rotation; the scapula moves forward and the vertebral border of the bone is raised.

Review of Recommended Treatments.

In most of the articles dealing with the above subject, mention is made of treatment but little is said of electrical stimulation or the best area to apply the electrode for maximal contractions.

Fitchet has pointed out that the long thoracic nerve is exposed to trauma as it transverses the scalenus medius. Also, its superficial position permits direct pressure by objects carried on the shoulder, particularly if such objects are unloaded by a short, quick shrug of the shoulder. He suggests that after rest and subsidence of the acute condition, the "Faradic current, gentle massage, and muscle training and reeducation are of value." He does not mention the area where the electrical stimulations are to be given nor does he mention electrical treatments in his case reports.

Horwitz and Tocantins in 1938 mention heat, galvanic stimulation, massage, and a supportive brace in treatment, but no mention is made regarding the location of the electrode in the galvanic stimulations. They do write, "electrical stimulation is applied critically and accurately so that only the paralyzed muscle and its stretched protagonists are stimulated."

Ball, in an article describing a case of serratus magnus paralysis following the injection of antitetanic serum, writes; "Thirty treatments of galvanic and sinusoidal current to the affected muscle were given at the naval hospital. Excellent results were obtained in the treatment by using galvanic and sinusoidal current to the affected muscle." This is the usual description without any other details regarding the area to which stimulation is applied. No mention is made of direct stimulation to the main nerve where the fifth, sixth and seventh cervicals come out of the cord, through, and on the scalenus medius muscle in the posterior triangle of the neck.

Diddle in 1948 mentioned the use of diathermy and massage in his case of anterior paralysis during puerperium but he does not say anything about electrical stimulation. He writes, however, that physical therapy and immobilization of the part aid in lessening the amount of atrophy of the muscle while the nerve regenerates.

Hansson presents the most detailed treatment from the standpoint of physical medicine when he writes that, in addition to immobilization and active exercises, the muscle can be stimulated by "heat and electrical contractions." He locates the muscle for stimulation, by the electrical current, between the pectoralis major and the latissimus dorsi, above the origin of the external oblique muscle. Interrupted galvanic stimulation is used first; faradic stimulation is used as soon as the muscle responds to this current.

CASE REPORT

P. D., married, white, 27 year old female, was working as a stitcher when she ran a needle into the thumb and index finger of the left hand. On that day, April 5, she was given tetanus antitoxin. Three days later she became feverish and her legs were so weak she was unable to walk to the bathroom. Five days after the TAT injection, she developed severe pain across the shoulders and down both arms with weakness of both arms. She was in bed for three weeks during which time the leg weakness cleared, but she noted she was unable to raise her right arm above the right shoulder level, could not comb her hair, and had weakness and a "pulling pain" in all the muscles of both arms and shoulders. May 14, she looked in her mirror and noted a difference in the appearance of her shoulder blades. On May 27, a neurosurgeon examined her. He wrote that she had a definite pronounced slope downward of the right involved shoulder compared to the left uninvolved side. She was unable to elevate the right arm beyond 90 degrees either in forward flexion or abduction. However, with the scapula fixed and held by the examiner's hand, she could raise the right arm to about 160 degrees. The neurosurgeon concluded: "Acute radiculomyelitis. Involvement of the peripheral nerves as a result of tetanus antitoxin injection occurs infrequently but occurs often enough to be considered as a separate entity. The most important thing to do in treatment is to receive physical therapy in the form of electrical stimulation to the serratus magnus muscle to prevent further winging of the scapula." On June 2, eight weeks after the onset, the patient was hospitalized for electrical stimulation which was given for two weeks, until June 15, when she was given treatments three times a week on an outpatient basis. On July 23, three and one-half months after the onset she was seen by the insurance company consultant. He wrote: "I believe that this patient will be able to return to work next Monday with the understanding that she be placed on a job that will allow full movement of the shoulder girdle, and that she will not allow herself to become fatigued. There is evidence that the serratus magnus is returning in power. It is strongly recommended that she continue with electrical stimulation of the muscles around the shoulder girdle."

Comment.

In electrical stimulation to two different areas on normal subjects and on those with serratus anterior paralysis due to different causes there was a definite difference in the effectiveness of the muscular response. The attempts to stimulate the fibers of the serratus anterior muscle under the arm in the upper axilla resulted usually in a minimal, barely noticeable contraction of the area stimulated. Therefore, little or no appreciable movement of the scapula by the serratus anterior

resulted. Failing to get a satisfactory response in these attempts, stimulations were given to the area in the neck above the clavicle and under the anterior edge of the upper fibers of the trapezius. A definite "pull forward" of the arm on the involved side was noted as well as a tendency to correct the "winged scapula" deformity. However, a slight variation in the depth or positioning of the electrode within this region usually would mean the difference between a good and a poor application for maximal contraction.

The patient of the "case report" was started on the interrupted galvanic current since she did not react well to the tetanizing current and was considered to have a complete reaction of degeneration. As she improved, treatments were given with the tetanizing current. According to the neurosurgical consultants her recovery and return to work was earlier than usual for such cases. The reason for this may be that, though electrical stimulation has no effect on the nerve, it may, at least, prevent deconditioning of the muscle. Other writers state that electrical treatments increase the size of the muscle fibers and their metabolic capacity, increase muscle excitability and contractility, delay muscle atrophy and enhance recovery, and maintain muscle weight and strength better the more frequently a denervated muscle is stimulated. It must not be overlooked that there is also the possibility that electrical stimulation helps prevent a "psychological block."

Continued investigation should help determine the practicality and the superiority of stimulating one area instead of the other for improved response and results in electrical treatment of the "winged scapula."

CONCLUSIONS

Stimulation of the paretic long thoracic nerve in an area in the posterior triangle of the neck appears to be more effective than in the upper axilla.

REFERENCES

1. Fitchet, S. M.: Injury of the Serratus Magnus (Anterior) Muscle. New England J. Med., 203:818-823 Oct. 23, 1930.
2. Horwitz, M. T. and Tocantins, L. M.: Isolated Paralysis of the Serratus Anterior (Magnus) Muscle. J. Bone & Joint Surg., 20:720-725 July 1938.
3. Ball, C. R.: Paralysis Following Injection of Antitetanic Serum; Case Report with Serratus Magnus Involved. U. S. Nav. M. Bull., 37: 305-309 April 1939.
4. Diddle, A. W.: Paralysis of the Serratus Anterior Muscle with a Winged Scapula during the Puerperium. Florida M. A. J., Vol. XXXIV, Number 8, Feb. 1948.
5. Hansson, K. G.: Serratus Magnus Paralysis. Archives of Physical Medicine Mar. 1948.
6. Fischer, E.: Effect of Faradic and Galvanic Stimulation on Course of Atrophy in Denervated Skeletal Muscles. Am. J. Physiol., 127, 605, 1939.
7. Gutman, E. and Gutman, L.: The Effect of Electrotherapy in Denervated Muscles in Rabbits. Lancet 1, 169, 1942.
8. Hines, H. M., Thomson, J. D. and Lazare, B.: Physiological Basis for Treatment of Paralyzed Muscle. Arch. Phys. Ther., 24, 69, 1943.
9. Osborne, Stafford, L., Kosman, A. J. Bouman, H. D., McElvenny, R. T. and Ivy, A. C.: Electrical Stimulation of Muscles in Treatment of the Acute and Chronic Forms of Anterior Poliomyelitis; Physical Therapy Review, 29, 63-68, 1949.

Meet Our New Contributors

Ann H. Downer, Assistant Technical Director, Physical Therapy School, Albany Hospital, Albany, New York, was graduated from Syracuse University in 1946 with a B.A. degree. The following year she was awarded a certificate in physical therapy from the D. T. Watson School of Physiatrics, Leetsdale, Pennsylvania.

Among the positions which Miss Downer has held are Chief Physical Therapist, Grace Hospital, Hutchinson, Kansas; Chief Physical Therapist, People's Hospital, Akron, Ohio; and Instructor, Division of Physical Therapy, Stanford University, Stanford, California. At Stanford University she completed requirements for a master's degree in 1951. Her physical therapy work and her studies at Stanford University were aided by scholarships from the National Foundation for Infantile Paralysis.

Miss Downer is a member of the American Physical Therapy Association and the American Registry of Physical Therapy Technicians.

Herman Kabat, M.D., Medical Director, Kabat-Kaiser Institutes for Muscular Rehabilitation, is the author of many publications on neuromuscular rehabilitation, physiology, and neurology.

Dr. Kabat received his B.S. degree from New York University, his Ph.D. from Northwestern University, and his M.D. from the University of Minnesota. He was Fellow in Neurology and Fellow in Anatomy at Northwestern University; Instructor in Physiology and Assistant Professor of Physiology and Neuropsychology at the University of Minnesota.

He is a member of many medical and scientific societies, including American Physiology Society, American Association of Anatomists, the Association for the Advancement of Science, and the Congress of Physical Medicine.

Jacob L. Rudd, M.D., Chief, Physical Medicine and Rehabilitation, Boston City Hospital and Assistant Chief, Boston Veterans Administration Hospital, received his bachelor's degree from Harvard University and his medical degree from Harvard Medical School.

During the War, Dr. Rudd was Chief, Physical Medicine and Rehabilitation at Philadelphia Naval Hospital, at Pearl Harbor Hospital, and Consultant at the Chelsea Naval Hospital.

Dr. Rudd is President, New England Society of Physical Medicine; Chairman, Rehabilitation Committee, United Community Services, Cambridge; Chairman, Rehabilitation Commission, State of Massachusetts; Member, Board of Vocational Education, Massachusetts Department of Education; Vice-President, Cambridge Tuberculosis and Health Association; a Diplomate, American Board of Physical Medicine and Rehabilitation, and a member of the American Congress of Physical Medicine and Rehabilitation.

Strength of the Elbow Flexor Muscles*

Ann H. Downer, M.A.

The importance of movement in terms of specific action of muscles has long been recognized in medicine as well as in other professional fields which are concerned with the treatment of muscular disability. Accurate and detailed information on muscle strength and function should be useful as a basis for muscle testing, specific exercise, and functional activities.

The literature describes numerous experiments which have been conducted to evaluate muscle strength in relation to physical fitness, and various types of muscle tests have been devised. Yet investigation of source material on force exerted by specific muscle groups reveals very little quantitative information. There was found to be a difference of opinion regarding whether the elbow flexor muscles exert more force at the beginning of the arc of elbow flexion or when the elbow nears a right angle. Also, conflicting statements were found regarding the relative strength of elbow flexion when the forearm is in supination, pronation, or in the mid-position.

The actual strength of the elbow flexor muscles would be difficult to determine directly. The muscle force exerted on a body lever can be measured indirectly, however, by resistance applied to the segment. Hence, the term elbow flexor "strength," as used in this study, really refers to the rotational moment exerted about the elbow joint as measured by a counter force at the wrist.

The objectives of this study were: (1) to determine the force exerted at various points through the arc of elbow flexion; (2) to compare the strength of the right and left elbow flexor muscles; (3) to compare strength readings obtained from the "break" and isometric tests; and (4) to determine the position of the forearm (supination, pronation, or mid-position) in which maximum strength is obtained when the elbow is flexed to 90 degrees.

Assistant Technical Director, Physical Therapy School, Albany Hospital, Albany, New York.

Presented to the Research Section at the Annual Conference of the American Physical Therapy Association, Philadelphia, June 1952. This material was abstracted from a thesis submitted to the Division of Physical Therapy, Stanford University, in partial fulfillment of the requirements for a master's degree.

* The electronic instrument for force measurements used in this study was made available through a grant from the National Foundation for Infantile Paralysis.

Procedure

By the use of a standard goniometer, elbow flexion points of 10, 30, 60, 90, 120 and 135 degrees were determined. Flexion strength of both elbows of 30 adult women between the ages of 20 and 50 years was tested with the Beasley myodynemeter. The forearm was in the mid-position, and both "break" and isometric tests were used. With the elbow at a right angle, flexion strength was also tested in the positions of forearm supination and pronation.

For all tests, each subject was lying supine on the plinth with the arms at the sides (See Figure 1.). Stabilization for elbow flexion in all positions and for both the "break" and isometric tests was effected by means of two straps secured over the top of the shoulder. A footboard was used to prevent the subject from sliding toward the foot of the table. The fatigue factor, although present to a degree, was reduced by giving the "break" tests on one day and the isometric tests at least two days later, and was equalized by changing the sequence of test points in the arc of motion.

For the "break" test, pressure was applied manually with the force gauge placed against a padded metal applicator immediately proximal to the wrist joint. With the elbow held at the desired angle of flexion by the subject, force was applied in the direction of elbow extension. As the elbow flexor muscles were forced to elongate through an arc of approximately 10 degrees, their maximum resistance was recorded.

In the isometric test, the elbow flexor muscles acted against fixed counter pressure (See Figure 2). The force gauge was placed in a sling system with the forearm in the sling and the other end attached to an immovable standard.

Test records were made by means of a pen recorder attached to the instrument. The results

Figure 1. Position used for "break" test.

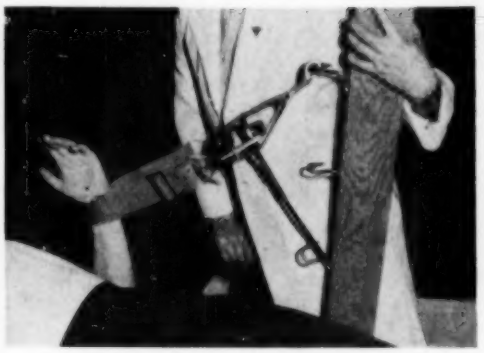


Figure 2. Position and apparatus used for isometric test.

of three tests were averaged to obtain the mean strength value.

RESULTS

The mean power of elbow flexion at 10 degrees for all thirty subjects in the "break" test was found to be 22.1 pounds in the right elbow and 19.4 pounds in the left elbow (See Figure 3). The mean power in both the right and left elbow flexor muscles continued to increase from 10 to 90 degrees in the arc of motion. At 90 degrees, the mean power of the right elbow flexor muscles was found to be 42.4 pounds and in the left elbow 35.9 pounds. At 135 degrees, the mean power had decreased to 31.7 pounds in the right elbow and to 27.5 pounds in the left elbow.

When the mean strength of right and left elbow flexor muscles was compared, it was found that there was a difference of 15.7 per cent at 10 degrees for the "break" test (See Figure 3). The percentage difference between the two extremities increased up to 90 degrees. At this point the percentage difference was 20.0 per cent. Beyond this point the difference decreased, dropping to 14.8 per cent at 135 degrees.

As in the "break" test, the highest mean strength for the isometric test was found to be at 90 degrees of elbow flexion in both the right and left elbows with a decrease in either direction away from a right angle (See Figure 4). The weakest point was at 10 degrees.

The percentage difference at 10 degrees was 5.3 per cent. Again this increased up to 90 degrees where it was 12.9 per cent, and decreased to the smallest difference of 4.2 per cent at 135 degrees.

A comparison between both types of tests,

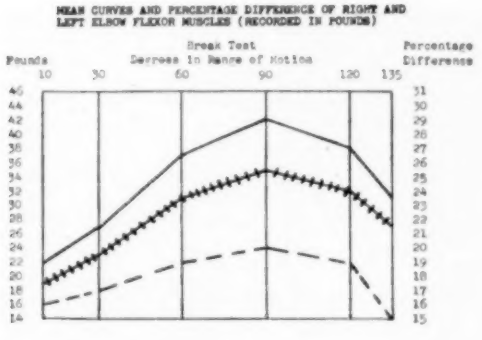

MEAN CURVES AND PERCENTAGE DIFFERENCE OF RIGHT AND LEFT ELBOW FLEXOR MUSCLES (RECORDED IN POUNDS)
Break Test
Degrees in Range of Motion
Pounds
Percentage Difference
10 30 60 90 120 135

Figure 3. Break Test

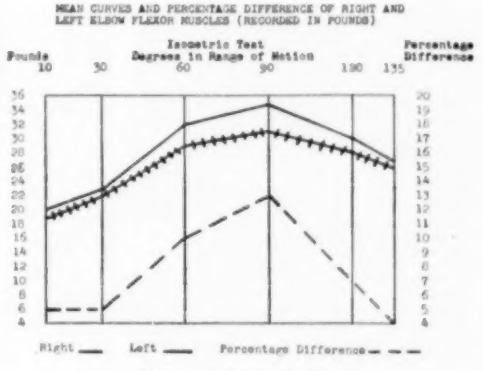


Figure 4. Isometric Test

using values of combined right and left extremities, indicated the mean "break" test figure was larger than that of the isometric test at each point tested. The greatest difference between the two tests was found at 120 degrees of elbow flexion (18.9 per cent), with the least amount of difference occurring at 10 degrees (4.5 per cent).

Critical ratios were computed to determine the significance of differences between right and left flexor strengths for individual subjects. On the basis of "break" test figures, the difference was found to be significant at each point in the range. In the case of the isometric tests, critical ratios were not consistent in their indications.

Relation of Forearm Position to Elbow Flexion Strength

The greatest flexion strength, as determined by both types of tests, was found with the forearm in the mid-position. Supination was next, with an average of 3.6 pounds less than the mid-position, and forearm pronation was found to be the weakest position for elbow flexion.

Summary

In summary, figures obtained in this study indicate the following:

(1) Elbow flexion force is greatest when the elbow is at a right angle position, and it decreases as the elbow moves in either direction away from a right angle. Therefore, a physical therapist who tests the elbow flexors with the forearm fully flexed may expect less force and give a lower grade than if the elbow is maintained at a position of 90 degrees.

(2) More force can be expected from the use of a "break" test in muscle testing than from an isometric contraction.

(3) The elbow flexors of the dominant extremity can be expected to exert greater force than that of the opposite side. Whether or not this is a significant difference was not conclusively indicated in this study.

(4) Exercises or muscle tests requiring elbow flexion strength can best be done with the forearm in the mid-position. Supination of the forearm is less advantageous, while elbow flexion in pronation is the weakest position for performances requiring strength.

New Useful Devices in the Rehabilitation of the Hemiplegic Hand

Max V. Weinstein, M.D., and Alan Gordon, B.S.

The management of the hemiplegic hand constitutes one of the most difficult problems in physical medicine and rehabilitation. The anatomy and physiology of this part are highly specialized and intricate. When deranged by hemiplegia, its functional restoration becomes a formidable task.

We agree with others that if the fingers are kept in proper alignment during rest and exercise, rehabilitation will be facilitated.

To this end we have improvised several useful devices.

Figure 1 — *Exercise table:*

A sturdy table is equipped with pulleys and graded weights. A sling is employed to counteract gravity. One pulley is attached at right angles for thumb exercises.

Max V. Weinstein, M.D. — Associate in the department of Physical Medicine and Rehabilitation at the Brooklyn Hebrew Home and Hospital for the Aged. Adjunct in the department of Physical Medicine and Rehabilitation at the Jewish Sanitarium and Hospital for Chronic Disease and Assistant Visiting in the department of Physical Medicine and Rehabilitation at the Kings County Hospital, Brooklyn, New York.

Alan Gordon, formerly with the Tilton General Hospital at Fort Dix, New Jersey, the United States Public Health Service, and the New York City Department of Health, Cerebral Palsy Unit.

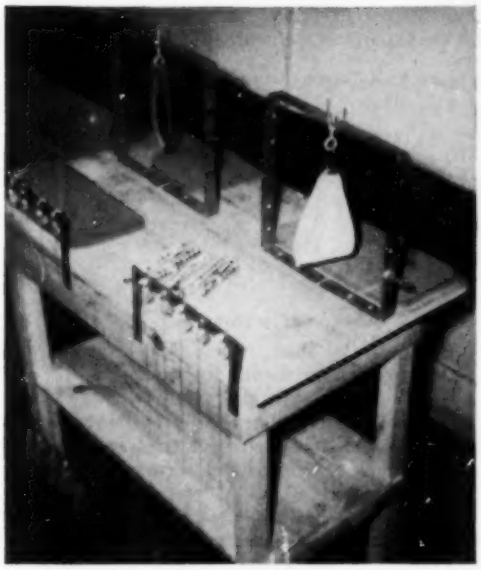


Figure 1

Figure 2 — *Exercise glove:*

In this glove, eyelets have been inserted into the distal ends of the fingers. These are connected to the hooks and weights of the table. A wrist band is attached to the volar surface of the glove. It has four interdigital slips that join over the dorsum of the hand, holding the glove in place during exercise procedures. The interdigital ties are adjusted firmly, applying the reinforcement technic to the lumbrical-interosseous muscle functions.

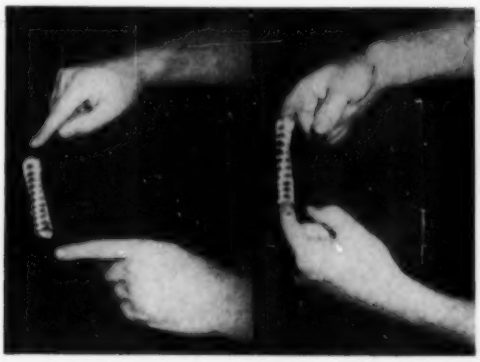


Figure 3a *Figure 3b*

Figure 2a: Dorsal view of exercise glove.

Figure 2b: Dorsal view of exercise glove attached to hooks and pulleys of exercise table.

Figure 2c: Ventral view of exercise glove attached to hooks and pulleys of exercise table.

Figure 3 — *Japanese finger traps:*

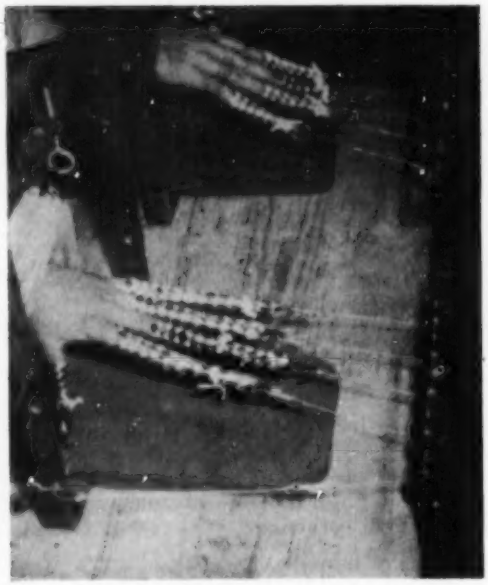
A straw tube is so woven, that when the ends are pulled apart, the lumen becomes constricted. When pushed together, the aperture widens. This tube hitherto has been considered a toy. We have found it to be invaluable in the rehabilitation of hands and fingers. In cases of severe hand contractures and deformities where one encounters considerable difficulty in putting on a glove, it is very simple to slip the finger traps over the ends of the digits. By attaching rings or hooks to this device, exercise procedures become facilitated.

Figures 3a and 3b illustrate the technic of application of finger traps for use in reciprocal

Figure 2a

Figure 2b

Figure 2c



and resistive exercises. The same procedure can be used to overcome contractures.

Figure 4 — *Finger traps with hooks and rings:*

The hand in the foreground illustrates the use of hooks in conjunction with the finger traps. The hand in the background illustrates the use of the rings.

Figure 4 (left)

Figure 5 — *Finger trap glove:*

Figure 5a: Four ringed finger traps are placed on the four medial fingers.

Figure 5b: A tie is slipped through the rings.

Figure 5c: A pulley handle is placed in the involved hand. The tie is tightened and fastened over the dorsum of the hand, securing the handle for exercise purposes.

Figure 5d: Ventral view.

Figures 5e and 5f: Same principle applied to shoulder wheel grip.

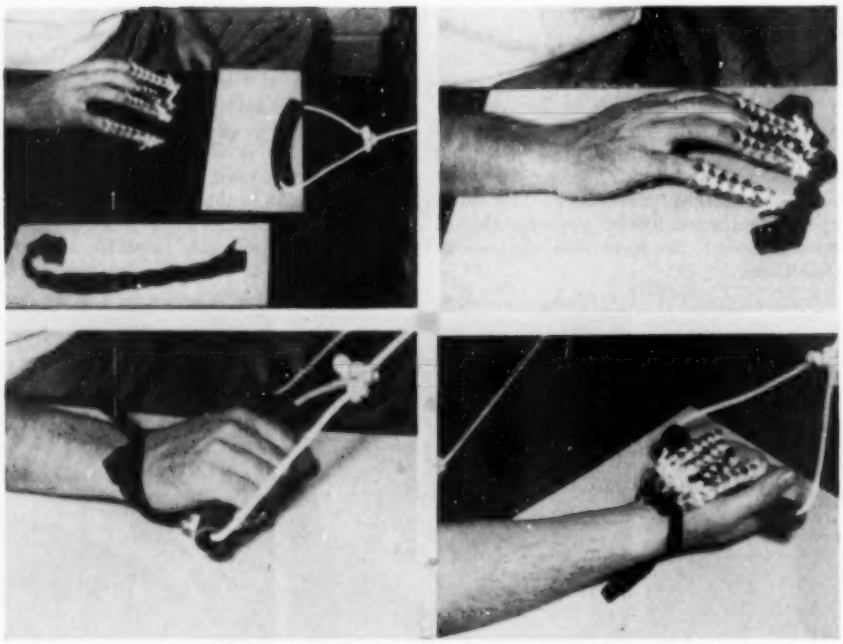


Figure 5a (above)
Figure 5c (below)

Figure 5b (above)
Figure 5d (below)

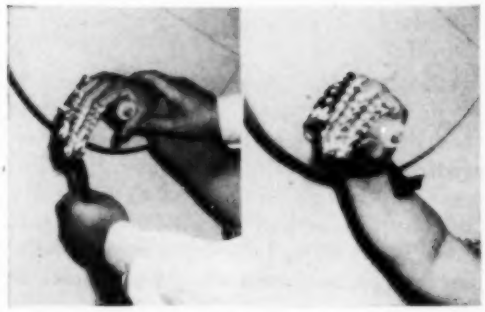


Figure 5e *Figure 5f*

Figure 6 — *Hand splint glove:*

Two cotton gloves are put on the involved hand. Appropriate stays are inserted between the gloves extending to the end of each finger on their dorsal aspects. A comfortable wrist band holds the proximal ends of the stays in place. We now have an inexpensive, flexible method of splinting the hemiplegic hand in proper alignment while at rest.

Figures 6a, 6b, 6c and 6d illustrate the method of application of this glove.

CONCLUSION

The aforementioned devices utilized during rest and exercise have improved the alignment of the involved fingers, hands, and wrists of our hemiplegic patients. We feel that this contributes considerably to their rehabilitation.

BIBLIOGRAPHY

1. De Rosa, A. J.: An Exercise Glove, Physical Therapy Revue, Volume 30, No. 4, 138-139, April 1950.
2. New York University — Bellevue Medical Center, Institute of Physical Medicine and Rehabilitation: Self Help Devices in Rehabilitation.
3. Rose, D. L., Hendell, H. W.: Rehabilitation of Hand Function in Rheumatoid Arthritis, The Journal of the American Medical Association, Volume 148, No. 16, 1408-1413, April 1952.

The authors express their gratitude to Leonard Brodsky, for his fine photographic technic which has aptly portrayed the rehabilitation devices, and to Victor Weinstein, premedical student at Alfred University, who created the hand splint glove.

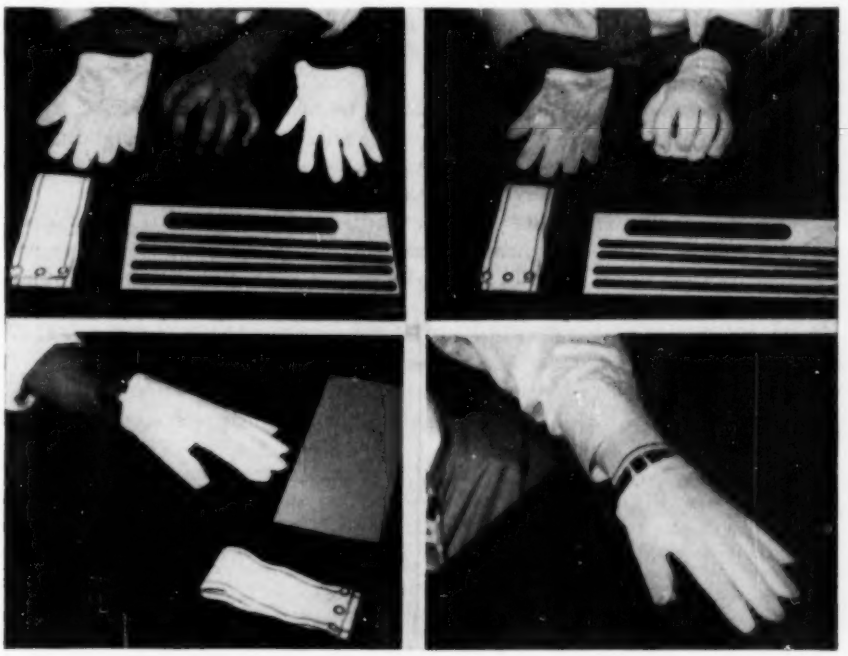


Figure 6a (above) *Figure 6b (above)*
Figure 6c (below) *Figure 6d (below)*

Editorials

Professional Relationships

A LARGE responsibility for intellectual operations and the exercise of individual judgments are inescapable requirements of a profession. Unless Physical Therapy meets these requirements, it will be an organization of technicians rather than of professional people. Furthermore, because physicians need the specialized knowledge of the physical therapist, the interests of patients may be served better if physical therapists achieve a truly professional stature.

There is general confidence in the therapists' ability to give treatments. However, the criticism is occasionally heard that patients sometimes receive incorrect amounts of treatment — either substantially more or less than needed — and that some specific treatments that would be beneficial are not given. This is often caused by inadequate communication between physician and therapist. Orders may be poorly understood or not well stated. The physician may not be informed that his patient is missing physical therapy appointments.

Lack of communication inevitably means an absence of team work. The therapist may be puzzled at the prolonged reordering of the same series of treatments for a given patient, especially if the patient is discouraged at his apparent lack of progress. The doctor hears comments from the patient that tend to disturb his good relationship with the therapy department. The physical therapist may have some useful observations and suggestions for the physician which she is as reticent about making as the physician is to ask her opinion.

The initiative to improve communication should be taken by the therapists. The physical therapist should help evaluate the patient and assist the physician in planning the course of treatments best suited to the patient's needs. The physician, who has the responsibility for the final decision, should expect this kind of service from the therapist.

Few physical therapists are in the fortunate position of working in a department actively directed by a physiatrist, although the number is gradually increasing. Here satisfactory professional relationships are more easily reached. Physiatrist and therapist attain a high level of team work in their ministrations to patients.

Until physical therapists view themselves as thinking partners in the over-all job of returning the patient to health, their possibilities as a professional group cannot be fully realized.

Thoughtful and determined effort by both doctors and therapists to strengthen their lines of communication will add to the usefulness and dignity of the functions each must perform, and will benefit the patients entrusted to their joint care.

HUGO V. HULLERMAN, M.D.
Director of Hospital Services
United Hospital Fund of New York

Your Association

THE REPORT of the Semiannual Executive Committee meeting represents the time and effort of twenty people either elected or appointed or employed by you as members of the A.P.T.A. They spent two and one-half days and nearly as many nights trying to solve the problems which matter most to physical therapists who are professional people — these problems must be solved and they will be with the help of every member — the recruitment problems, the financial problems, the problems of maintaining our professional standards. There are some of us who still ask ourselves or others the question, "What does the Association do for me?" If we know our bylaws, we know that the objects of the Association are to promote the profession. Since all of us are in the profession and *are* the Association, we must necessarily do *for* the Association in order that anything may be done for us as individuals. The question should be "What have I done for the profession?" The physical therapist must do his daily work with intelligent enthusiasm, so that not only patients and physicians will recognize this profession, but lay people also will become acquainted with it. He must bind himself with his professional colleagues in his professional organization, the A.P.T.A., then he will be satisfied with his own answer to the question. Your National Office professional staff is dedicated to do for the profession, your Executive Committee is obligated to do for the profession because you have chosen them, and it was in this spirit that the Executive Committee met together in semiannual session.

DOROTHY E. VOSS
Secretary

Summary

Semiannual Executive Committee Meeting

On November 20-22, 1952, the elected officers, directors and the appointed standing committee chairmen of the American Physical Therapy Association met with the professional staff members of our National Office in order to discuss the problems and projects of the Association and to outline further work which will help develop and maintain the high standards which we as a professional organization have set for our profession.

The meeting was opened by Col. Harriett S. Lee, President, who reminded the members of the Executive Committee that it is their responsibility to direct the manner in which the policies of the Association are carried out and to transact the business of the Association in compliance with the bylaws and the enactments of the House of Delegates. Colonel Lee also pointed out that the Executive Committee is dependent upon the National Office staff for information about the existing projects and current problems facing the profession. In turn, the National Office staff is dependent upon the Executive Committee for direction and guidance in the work they are to accomplish.

Colonel Lee then called upon the members of the professional staff employed by the Association for reports of their activities and work done since last June. Miss Elson's and Miss Haskell's reports revealed the growth of the Association and the increase in problems and responsibilities which come with approaching maturity. The demands made upon the Association for help and guidance are continually growing — more chapters, more schools, more polio, more use of physical therapy are the basis of these welcome, if trying, demands.

With a higher incidence of polio than has ever been known and with the gamma globulin projects in full force, the Polio Recruitment and Placement Services were of necessity more active than ever before. Miss Blair and Miss Whittemore reported in some detail upon their visits

to clinical facilities and the encouraging results of the gamma globulin projects.

Miss Hewitt reported upon the many facets of the work of the Educational Consultant. Five new schools opened this fall and in all of the now-existing schools 113 more senior students could have been enrolled. The need for even greater recruitment efforts was obvious. The Association has had contact with 117 foreign-trained physical therapists working in this country, all of them members of the professional organization in their own countries. The need for further development of our program for the foreign-trained is apparent.

After the National Office staff reports, Miss Kohli, chairman of the Finance Committee, reported a deficit budget for the year and recommended that a newsletter should be mailed to the entire membership containing an analysis of the Association finances. While this does not mean that the Association is in the "red," it does mean that some of the reserve funds must be used for current expenses. Miss Elson had pointed out earlier that while the financial structure of the Association has quadrupled since 1944, the amount collected in dues has only doubled. This has been possible, because of grants to the Association by the National Foundation for Infantile Paralysis.

The afternoon session of the first day was given over to workshop groups on Recruitment, Ways and Means, 1953 Conference Program, and Public Laws. Reports of discussion and suggested solutions to problems were presented to the entire group the following day.

Recruitment was recognized both as a current problem and as a long-term problem. These initial projects were set up. (1) A physical therapy film for purposes of recruitment will be available about May 1, 1953; 50 prints will be made and the entire expense assumed by National Foundation for Infantile Paralysis. (2) The steering committee (Educational Consultant, Chairman of Education, Relations and Exhibits) will mail to the chapters in January, 1953, a guide for chapter recruitment programs. (3) Film strips with scripts will be made for the high school level; 50 copies will be available for loan, additional copies may be purchased at $1.00 each from the producer, and the Association will receive a royalty on every set sold. Possibly these will be available by May, 1953. (4) The Association will sponsor a poster contest. The winning design will be printed and 50,000 copies made available for widespread distribution by chapters. Possibly available by April, 1953.

The Ways and Means work group, Miss Dorothy Fredrickson, chairman, was faced with the formidable task of recommending a solution to the financial problems of the Association and a plan for increasing the income of the Association so that recruitment projects and current expenses can be met. The broad objectives of the committee were set up as follows:

(a) To investigate all possible sources of grants and gifts at the national level and to seek funds for specific projects.

(b) To investigate and establish a fund to which tax-free gifts may be donated by individuals.

(c) To motivate and give guidance to chapter committees.

Miss Nesbitt, member of the committee on program, presented and explained a program for the 1953 conference in Dallas. The theme will be "The Patient, His Evaluation and Program for Rehabilitation." There will be instructional workshops again this year. Details will be published in forthcoming issues of the Review.

Miss Dorothy Baethke came in to report as a special committee chairman. She gave an account of the committee's action to recommend Minimum Essentials for Physical Therapy Schools. All but two of the existing schools took part in conferences regarding the revision of the essentials and they will again be reviewed before presentation to the Council on Medical Education and Hospitals of the American Medical Association.

Miss Baethke also reported on the work of the committee which was appointed last June to study a retirement plan and salary scale revision for the National Office staff. A retirement plan similar to those in effect in other health and welfare agencies was presented and adopted by the Executive Committee. Recommendations regarding a salary revision were postponed pending a job analysis study to be done in the National Office.

The need for a scientific examination which will be adaptable to use for licensing in the various states and for qualifying the foreign-trained has long been considered and is in preparation. Dr. Lillian Long of the Professional Examination Service of the American Public Health Association appeared to explain the contract submitted by this group. The test items have been secured from the membership but will be processed and compiled into examinations under the contract.

The World Confederation for Physical Therapy will meet in London in September, 1953, and it was decided that Colonel Lee should be the delegate representing the Association; two alternates are to be appointed.

Five foreign-trained physical therapists were presented as having fulfilled membership requirements and were accepted as active members of the Association.

Miss Carlin reported on the *Physical Therapy Review*, and the Executive Committee accepted the recommendations of the *Review* Editorial Board, namely (1) to publish the Chapter Directory in the *Review* only twice a year and at that time to include the names of District chairmen and secretaries, (2) to publish the School Directory in detail only annually but with a listing of school names and addresses in other issues.

DOROTHY E. VOSS
Secretary

Recruitment Film

It is with gratitude that we announce this momentous news. The National Foundation for Infantile Paralysis is sponsoring the production of a twenty-minute sound film in color to be used for the purpose of recruiting prospective physical therapists.

Fifty prints of this film will be made for loan to all who have a part in physical therapy recruitment. The film will be made by Science Pictures, Inc. of New York. Technical guidance from the National Foundation for Infantile Paralysis and the American Physical Therapy Association will be supplied. Although the work of writing the script has just begun it is anticipated that prints will be ready by May 1953.

How many physical therapy students have you recruited this month?

Meet Your Advisory Council

Because of Dr. Samuel M. W. Wishik's many contributions to the public health field and his sincere interest in handicapped children, the Executive Committees of the past have recognized that he would be a valuable member of our Advisory Council. We are fortunate to have his acceptance of an appointment to serve us in this capacity for the next two years.

Samuel M. Wishik, M.D., is now Professor of Maternal and Child Health in the Graduate School of Public Health, University of Pittsburgh. He received his B.A. degree from Columbia College in 1926; he was granted a medical degree from the College of Physicians and Surgeons, Columbia University in 1929, and in 1948 the School of Hygiene and Public Health awarded him the degree of M.P.H. He practiced as a pediatrician from 1934 to 1942 when he entered the U.S. Public Health Service as Senior Assistant Surgeon. Since that time he has held many important posts in the field of public health both in the federal service and in New York City.

From January 1949 until July 1951 Dr. Wishik was Director of the Bureau of Child Health, Department of Health, New York City. In addition to his present appointment at the University of Pittsburgh, he serves as Medical Consultant to the Association for the Aid of Crippled Children; Public Health Consultant for the National Society of Crippled Children and Adults, Inc.; Maternal and Child Health Consultant, Department of Public Health, City of Pittsburgh. He is affiliated with professional organizations representing medicine, public health, pediatrics, cerebral palsy, heart and rheumatic fever.

Many of the articles which he has published would be of particular interest to physical therapists and include a paper given at the 1950 American Academy for Cerebral Palsy entitled, "Training of Professional Personnel for Cerebral Palsy Work."

Samuel M. W. Wishik, M.D.

WORLD CONFEDERATION FOR PHYSICAL THERAPY *News*

Interim Scientific Program—First International Congress

(THEME: The Patient's Own Activity as the Underlying Principle of Physical Therapy)

Monday, Sept. 7	**Physical Therapy in Neuromuscular Disorders**
11:30 a.m.	Lecture by H. J. Seddon, C.M.G., M.A., D.M., F.R.C.S. "The Pathology of Lower Motor Neuron Disturbances in Relation to Treatment."
2:00 p.m.	Lecture by Herman Kabat, Ph.D., M.D.
3:30 p.m.	Demonstration by Margaret Knott, Chief Physical Therapist, Kabat-Kaiser Institute.
Tuesday, Sept. 8	**Physical Therapy in the Rheumatic Diseases**
9:30 a.m.	Lecture by Dr. Hugh Burt, M.A., F.R.C.P., "The Physiotherapist and the Arthritic Patient."
11:00 a.m.	Lecture by Wallace Graham, M.D., M.R.C.P. (Eng.), F.R.C.P. (C), (with film).
2:30 p.m.	Study Visits and Films at Central Hall.
Wednesday, Sept. 9	**Physical Therapy in Diseases of the Chest**
9:30 a.m.	Lecture by Sir Clement Price Thomas, F.R.C.S. "The Value of Physiotherapy in the Treatment of Diseases of the Chest."
11:30 a.m.	Demonstrations by Physical Therapists
2:30 p.m.	Films at Central Hall Study Visits Meetings of sectional interests in hospitals, etc. Tours to places of interest (not physical therapy)
Thursday, Sept. 10	**Papers by Physical Therapists on Treatment and Research** (Reports of study and experience by physical therapists)
9:30 a.m.	Papers by physical therapists from different countries: Amputations; Paraplegia; Peripheral Nerve Lesions; Recent Injuries; Relaxation for Psychopathic Disorders; Antenatal Training (exercises for maintenance of muscle tone); Cerebral Palsy; Gait Analysis; Head Injuries; Poliomyelitis; Diseases of the Chest.
3:00 p.m.	General Meeting of the World Confederation for Physical Therapy.
Friday, Sept. 11	**Physical Therapy in Industry**
9:30 a.m.	Lectures by L. W. Plewes, M.A., M.D., F.R.C.S. "Physical Therapy in Industry, with Particular Reference to Sudeck's Atrophy." (with film)
11:30 a.m.	Posture in Industry (Scandinavian Symposium)
2:30 p.m.	"Resettlement in Industry" Opening Lecture by F. S. Cooksey, O.B.E., M.D., F.R.C.P. Lecture by Kurt Jansson (Finnish), Director of Rehabilitation of the World Veterans' Federation.
4:00 p.m.	Films connected with Industry.

PICCADILLY CIRCUS

Posters and preliminary programs have been sent to all of the approved physical therapy schools and Association chapters. Additional posters and programs are available in the National Office.

Do not delay in making plans to attend. Reservations in London will be difficult to obtain later. All applications for the Congress from the United States should be sent to the National Office of the American Physical Therapy Association, 1790 Broadway, New York, N. Y. Additional registration blanks are available. Please refer to the November *Physical Therapy Review* for details. *Act now.*

Physicians and members of allied medical professions register as full members of the Congress. The interim program for the Congress appears in this issue.

A.P.T.A. Delegate Chosen

Lt. Col. Harriet Lee, President of the Association, was appointed official delegate to the World Confederation for Physical Therapy by the Executive Committee.

The Chartered Society of Physiotherapy

Professor J. Whillis, chairman of the Council of the Chartered Society, in responding to a toast to the Society by its former Chairman, Dr. W. S. C. Copeman, said in part:

"I would like to repeat something . . . I have said on other occasions; that anyone who deals with patients must guard against the dangers of overspecialization and never forget that he is treating not a disease, not a part of the body, but the patient as a whole. The opening lecture by Dr. Main was most apt in this respect. We cannot be good doctors, good lawyers, good physiotherapists, unless we are also good citizens. In this way we shall have at heart the welfare of the individual, the nation and the world at large, and here in international relations in physiotherapy I am glad to say the Chartered Society is playing a leading part. During the next year we shall

spare no effort to make a great success of the International Congress, which the Chartered Society is organizing in September, 1953. I believe that the Chartered Society as 'The Incorporated Society of Trained Masseuses,' which originated in 1894, was the first national body of physiotherapists to be founded in any country. Therefore it is very fitting that the first International Congress of the World Confederation should be held in our country. We hope to have much to interest our visitors in our lectures, our hospitals departments and in the work of the Society as a body; how we have built up over more than fifty years a three-year full-time training course, how we are developing post-registration work for Chartered Physiotherapists and how we are training our teachers. We are proud that the Chartered Society's training has stood the test of time and has set the standard of qualification for work in the National Health Service. As you all know, the Chartered Society is the only body whose qualification is recognized without reserve in the Cope Committee's Report, and all applicants for work in the Health Service who have qualified after 1951 must be Chartered Physiotherapists.

"The Chartered Society's position is almost unique among professional bodies with a Royal Charter in this country, in that it is a training, examining and registering body and is also the organization looking after the professional and economic problems of its members after they have qualified.

"I feel that the foundations of much of the recent progress of the Chartered Society were laid during Dr. Copeman's Chairmanship of council, and I would like to thank him now, not only for the gracious way in which he has proposed the toast of our Society, but also for the work he did which has made my Chairmanship of Council so easy and so pleasant a task."

Finland

The Society of Physiotherapists in Finland celebrates its tenth anniversary, February 22, 1953. Congratulations and best wishes to the Society!

Courses by Dr. Cyriax

Dr. Cyriax of the Department of Physical Medicine, St. Thomas Hospital, London, will give a two-day course on the diagnosis of soft tissue lesions, and on manipulations and remedial massage for physical therapists attending the Congress. The lectures and demonstrations will be held on Friday and Saturday, the 4th and 5th of September. Any physical therapist wishing to attend should write to Dr. J. Cyriax, 72, Harley Street, London W 1.

Dr. Cyriax' text, "Treatment by Manipulation and Deep Massage," was reviewed in the October issue of the *Physical Therapy Review*.

Pre Congress Study Courses

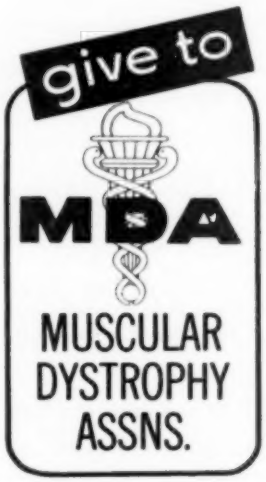
Two study courses have now been arranged:

A. Three-day Course on "Physiotherapy for Chest Conditions" at Brompton and Harefield Hospitals, London, September 2 to 4, 1953. Fee, £2. 12. 6d.

B. Three-day Course on "Rehabilitation after Amputation" at Queen Mary's Hospital, Roehampton, London, September 2 to 4, 1953. Fee, £2. 12. 6d.

Early application is requested, enclosing the fee, as the number to be taken in each course is strictly limited. The courses will run concurrently so physical therapists will be unable to attend both.

Send for your registration blanks now for the Congress. Registration fees are higher after March 1. If you wish to attend one of the above courses, application may be made at the same time to Mildred Elson, American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.



Association Activities

The Director Reports

December 22 — All of us in the National Office are very appreciative of the lovely cards which we have received from so many of you. Christmas time is remembering time and with each card there is recalled a visit, a good time enjoyed together, and the thought that next year will bring another reunion. You learn of new things that have happened to your friends — a new baby, an engagement, a marriage, or a new job.

I am constantly reminded at Christmas of how rewarding a profession physical therapy is as cards are received from former patients. One in particular pleased me this year. A severely involved polio wrote, "So much has been happening to me this past year that I want to share it with you. On August 7, I received my B.S. degree in Education, ranking second in a class of 132." "Jo" had polio in 1939 at the age of seventeen. When I first knew her she was a wheel chair patient; both arms, legs, and abdomen were severely involved. She was quite reconciled to her lot and needed considerable prodding both mentally and physically. She did become ambulatory, but it was slow. She faced the fact that she must earn her own living, but she had no training. In the intervening time, she has attended a state teachers college, has taken correspondence courses, and has been teaching for the last six years. She now has 25 third-grade pupils. I'm proud of Jo for she had what it takes to succeed over great odds. When I hear of this and accomplishments of other patients I continue to be grateful that I chose physical therapy as a profession.

As the holidays approached and we were asked, "What do you want for Christmas?" the answer in the National Office, and I'm sure by many throughout the country, was "More physical therapists!" Read in this issue of plans for an accelerated recruitment program and let's meet our goal in 1953. Happy New Year.

MILDRED ELSON
Executive Director

Your chapter needs you for recruitment.

Sister Elizabeth Kenny

In November Sister Kenny died in her home in Australia following a cerebral hemorrhage. Sister Kenny will never be forgotten and her name will continue to be associated with the treatment of polio throughout the world. The controversy and furor which she aroused will be forgotten — and her deep abiding interest and service to the polio patient will be remembered. That is as it should be. The very fact that there was controversy stimulated everyone to do a better job and the patient benefited.

Sister Kenny was an awesome person to many, but she was a very warm person also with a delightful and, at times, mischievous sense of humor. The twinkle in her eyes as she told of her experiences and her Irish anecdotes belied the outward austere appearance.

The relaxation and comfort patients received did not come entirely from the "Kenny hot packs," but from her kindness, reassuring manner, and skillful hands. Patients loved Sister Kenny.

I always will remember Sister Kenny as she was the first time I met her in Minneapolis shortly after she came to this country. Several physical therapists journeyed to Minneapolis to see her for a short visit and demonstration of her work. We found it thought provoking — and we found her to be a charming and dedicated person. We were intrigued with her hats. There were differences of opinion, but there was the good give-and-take which is enjoyed between professional colleagues.

Sister Kenny's many friends, co-workers, and former patients experienced a deep sense of loss and sorrow as the news of her death reached them. She will be missed but also remembered for her courage and devotion to the polio patient.

Abstractors Wanted

Members of the Association, interested in abstracting articles for the *Review* pertaining to physical therapy or allied subjects, should contact Sara J. Houtz, Associate Editor, Physical Therapy Review, 1790 Broadway, New York 19, New York.

CONFERENCE ★ 1953

BAKER HOTEL

Dallas, Texas • June 14-20, 1953

Big "D" in '53!

Big "D" as Dallas is affectionately known to the inhabitants of the Southwest, has grown in the last 100 years from a single log cabin to an internationally famous city. John Neely Bryan, a Tennessean, in 1841 came to Texas to set up a trading post along the banks of the Trinity River and thus the "city with the charm of yesterday and the spirit of tomorrow" was born.

Texans do brag, but we feel justly proud of our city — well known as an industrial center, rich farming area, railroad center, air capital of the Southwest and, last but not least, one of the greatest convention cities in the United States. Dallas also is well known as a style center for women's clothes.

The store responsible for setting style paces is the internationally famous Neiman-Marcus. While you are visiting Big "D" in '53, Neiman-Marcus is sponsoring a style show and luncheon, which we know you will want to attend.

We're sure you'll be fascinated with Dallas' shopping centers which have sprung up throughout the city. Highland Park Village, complete with Spanish architecture, boasts several branch department stores, theatre, bank, etc. There are similar areas in many sections, so shopping does not necessarily mean "going downtown."

Spaghetti at Parrino's, seafood at Jay's Marine Grill, steak at the Italian Village, Caesar Salad at Town and Country will be well remembered occasions of your stay here in the Lone Star State.

Round-up time is growing near, and we're becoming anxious to herd you into the corral of "Big 'D' in '53."

AGNES M. CONNER
Public Relations Committee

It's wise to be fashion wise — plan to attend the Neiman-Marcus style show and luncheon.

CENTRAL EXPRESSWAY

Stretching through the heart of Dallas, when completed it will cost $21,000,000 for 11 miles. No traffic crosses the 10-lane highway.

Compete in the Poster Contest

Personnel Policies

Personnel Policies for Physical Therapists, as recommended by the American Physical Therapy Association, has been slightly revised and is now being distributed in a different form — a four-page folded pamphlet 5½" x 8½". Major changes raise the recommended beginning salary and minimum vacation period.

Two new subjects have been included, "Part-Time Work" and "Private Treatments." These are available to anyone on request.

Membership News

Marriages

Rebecca Holton of Belmont, N. C., now Mrs. Rebecca H. Spaugh, Chapel Hill, N. C.
Esther M. Dahlstrom of Chicago, Ill., now Mrs. Esther D. Halverson, Chicago, Ill.
Lt. Doris V. Cobleigh of Hot Springs, Ark., now Mrs. Doris C. Banfield, Pawtucket, R. I.
Marion Mankin of New York, N. Y., now Mrs. Marion M. Marx, New York, N. Y.
Lt. Cleo E. Tweedy of Camp Atterbury, Ind., now Mrs. Cleo T. Stuart, Columbus, Ind.
Dorothy Kasputis of Pittsburg, Pa., now Mrs. Dorothy K. Dougherty, Kew Gardens, L. I., N. Y.
Esther M. Perrin of Greenwood, S. C., now Mrs. Esther P. Bivens, Greenwood, S. C.
V. Margaret Yoder of San Francisco, Calif., now Mrs. Margaret Y. Breckenridge, Fresno, Calif.
Gertrude Hirsch of Forest Hills, N. Y., now Mrs. Gertrude H. Schwarz, Kew Gardens, N. Y.
Florence Tregale of Longport, N. J., now Mrs. Florence T. Emsley, Absecon, N. J.
Ruth Kennett of Hot Springs, S. D., now Mrs. Ruth K. Kazmer, Omaha, Nebr.
Lucia Pepe of East Boston, Mass., now Mrs. Lucia P. Shearman, Newtonville, Mass.
Joan Schauble of Seattle, Wash., now Mrs. Joan S. Brown, Portland, Ore.
Emilie Riley of Shamokin, Pa., now Mrs. Emilie R. Lyon, St. Louis, Mo.

Chapter News

It is noted with approval that more chapters are obtaining financial assistance in the distribution of newsletters.

Northern California

Newsletter printed through the courtesy of Bush Electric Company, San Francisco. The Chapter announces two short courses for members: "Physical Therapy in the Diagnosis and Treatment of Peripheral Nerve Injuries," and "Relationship with Patients."

Delaware

The December issue carried four advertisements. The Chapter has a recruiting film available on loan by paying postal charges. It is entitled "Physical Therapy — A Service and a Career" and may be secured by writing Jean Wiley, 42 Hurst Road, Deerhurst, Wilmington, Delaware.

Illinois

The newsletter is underwritten this year by John W. Maselter Company, agent for Ille equipment in Chicago.

The Chapter held a luncheon meeting on December 7 when Dr. Meyer Perlstein moderated a panel on Cerebral Palsy. Appearing on the panel were a physical therapist, an occupational therapist, and a speech therapist.

On November 12, twenty-two physical therapists took the state board examination to become registered.

Quote from the newsletter, "If anyone walked into your department, would he be able to quickly and surely identify you because you are wearing the P. T. emblem?"

Minnesota

"Spark Gaps," Volume V, Number 3, carries notification to the chapter members of important chapter bylaw amendments.

New Jersey

The November newsletter includes a chapter directory, committee reports, a resume of last year's programs and an interesting account from one of the members, Arthur Brown, on his year's work in Greece.

Texas

The first issue of the chapter newsletter was received in the National Office in mid-December. It includes a report from the Chief Delegate, news from the Executive Committee, district reports and kick-off news for entertaining the A. P. T. A. Conference in '53.

Virginia

The December Newsletter carried an attractive winter scene on the cover, drawn by Jackson Jeffrey and colored by his fellow students of the Medical College of Virginia class of '53. Copied from the "Baruch Scoop," the school newsletter, was a ten queston quiz suggesting the importance of accepting professional responsibilities for professional advancement. The January meeting of

the Chapter was held jointly with the occupational therapists at McGuire Veterans Administration Hospital.

School News

New Student Members

Columbia University

Joseph P. Hayes
Josef Hoog
Gilda Tilow

Duke University

Ronald L. Chard, Jr.
Virginia Lee Floyd
Mary J. Fortenbacher
Martha Freeman
Jack Gamet
Suzanne A. Howe
Sally Ann Hurlburt
Constance W. Jenks
Charles N. Lautzenheiser
Ann E. Lowe
Maria Megalou
John H. Sykes

Mayo Clinic

Ann Appleby
Dorothy J. Burton
Marie Ann Cassel
Lois M. Cook
Peter M. Crane
Harriet L. Cronk
Betty J. Crumback
Jeanne E. D'Wolf
Susan B. Glocke
Beverly Ann Gryth
Richard C. Hanna
William A. Hillman, Jr.
Margaret E. Holcomb
Lela M. Johnston
Frances C. Lawrence
Mary Lawson
Sarah J. MacFarlane
Charlotte A. McIntire
Bebe A. Neal
Devota J. Nowland
Mary E. Robinson
Sherrod W. Shaw
Marilyn M. Strain
Helen E. Stremick
George C. Supp
Audrey M. Towler
Howard A. Waniga
Wilma Z. Ziegler

Saint Louis University

G. Donald Cullen

Stanford University

Carmel L. Bossenbrock
Diane E. Bullivant
Don Dahlquist
Betty B. Gettys
Richard Appel Hoe
Millard S. Kelley
Betty L. Kostenbader
Marjorie A. Landweer
Kathryn J. Leonard
Paula B. Linbach
Bella J. May
Judith Ann Roddewig
Audrey Wilson

University of Iowa

Frederick L. Aaron
John R. Anderson
Kent M. Bartges
Kenneth E. Brown
Richard C. Carleton
Robert W. Ellsworth
Jack R. Hoberg
Ervin B. Jones
Phyllis R. Lane
Stanley Mendelson
Dorothy M. Newfang
Dorothy T. O'Connor
Loren E. Quam
Eldon J. Reeg
Helen G. Reichert
Rudolph V. Sellers
George F. Sullivan
Richard Lee Waste

University of Pennsylvania

Samuel Davis
John Pancelli
Mario L. Salvanelli

New Schools of Physical Therapy

The Council on Medical Education and Hospitals of the American Medical Association approved the following schools of physical therapy at a meeting held December 1, 1952:

University of Connecticut
Storrs, Connecticut
Medical Director ..... John C. Allen, M.D.
Physical Therapy Director ..... Frances Tappan

Charity Hospital of Louisiana
New Orleans, Louisiana
Medical Director ..... Nathan H. Polmer, M.D.
Technical Director ..... Marion B. Stewart
Associate Technical Director ..... Sarah S. Rogers

University of Michigan
Ann Arbor, Michigan
Medical Director ..... James W. Rae, Jr., M.D.
Physical Therapy Director ..... Virginia Wilson

University of Buffalo School of Medicine
Chronic Disease Research Institute
Buffalo, N. Y.
Medical Director ..... Henry V. Morelwicz, M.D.
Physical Therapy Director ..... Mildred Heap

Grady Vaughn School of Physical Therapy
Baylor University Hospital
Dallas, Texas
(approved as of July 30, 1952)
Medical Director ..... Edward M. Krusen, Jr., M.D.
Physical Therapy Director ..... Peggy J. Dyer

Each of the above schools registered classes in September 1952. Graduates from the 1952 class at Grady Vaughn School of Physical Therapy are acknowledged as fully qualified by the retroactive decision of the Council.

Physical Therapy Club Holds Open House

On Friday, November 14, 1952, the Department of Physical Therapy and members of the Physical Therapy Club held their Third Annual Open House.

Invitations were sent to students in Massachusetts high schools and junior colleges through the Office of Admissions of Boston University,

Eight physical therapists have just been awarded certificates for the successful completion of the Army's training course in that field at Brooke Army Hospital.

Major Agnes Snyder, in charge of the early part of the course at Medical Field Service School, admires the certificate of 2d Lt. Rosemary Barber (left). Left to right, 2d Lts. Virginia Pace, Doris Shinn, Betty McGowan, Betty J. Cobb (back to camera) and Helen Cruickshank. Not shown are Virginia List and S. Jane Watson.

and this information was made available to the Massachusetts Chapter, American Physical Therapy Association Committee on Recruitment and Education. The Freshmen and Sophomore students of the College were invited by personal letter.

With the Senior physical therapy students serving as therapists and the Junior physical therapy students as patients the following were demonstrated: electrotherapy, hydrotherapy, thermotherapy, mechanotherapy and photo-therapy. Visitors were taken through the clinic to see leg and arm whirlpool treatment, ultra-violet technic, infra-red — with luminous, non-luminous and baker equipment — paraffin applications, massage, application of a plaster opponens splint, progressive resistive exercises through the media of a quadriceps boot, bed exercises, electrical stimulation, and diathermy application. Each therapist explained her particular assignment and answered questions.

Refreshments were served after each tour. The Secretary of Admissions of the College, several faculty members and student therapists talked with the visitors about physical therapy and courses offered by the three schools of physical therapy in the Boston area. Recruitment literature and college catalogs were distributed.

The visitors were welcomed by Dean George K. Makechnie, Adelaide L. McGarrett, Technical Director, and Ruth Hayward, President of the Physical Therapy Club. Other faculty members were introduced. Following this the movie, "Accent on Use," was shown.

There were 132 visitors, 70 of whom were from outside the College.

Listing of Postgraduate Courses

A revised list of postgraduate courses for the coming year will appear in the April (education) issue of the *Review*. Those wishing to list courses not included in last year's report are requested to send particulars, including type and length of course, administrator, beginning dates,

Wanted — 1,000 physical therapy students in 1953

tuition, and other pertinent information. This information must be in the National Office by February 15.

Poliomyelitis Courses and Workshop

Orthopædic Hospital, Los Angeles, has scheduled a one-week course in poliomyelitis, April 13 through 17, for physical therapists who are graduates of an AMA approved school. The course will cover all phases of polio with emphasis on coordination of services. For further information and application write to Miss Susan G. Roen, Orthopædic Hospital, 2400 S. Flower St., Los Angeles 7.

The Orthopædic Hospital course is prerequisite to and immediately precedes a Workshop on Poliomyelitis offered by the Physical Therapy Department of the University of Southern California, April 20 - May 8, in affiliation with the Los Angeles General Hospital and the Rancho Los Amigos. Work will be directed toward treatment of the acute and respirator patient and will include lecture and laboratory. Three units of graduate credit can be earned. For information and application write to Miss Charlotte Anderson, Physical Therapy Department, University of Southern California, Los Angeles 7.

Both courses are aided by a grant from the National Foundation for Infantile Paralysis.

List of Schools

In accordance with a recommendation from the Editorial Board of the *Physical Therapy Review*, the Executive Committee directed a change in policy regarding the monthly *Review* listing of approved schools of physical therapy. Details about directors, school requirements, length of courses and starting time will be given in full only once annually in the Education Issue. This will be noted on the cover for easy reference. A similiar list will be printed for distribution with recruitment material. In other issues of the *Review*, beginning this month, you will find the mailing addresses only.

Index to Current Literature

The Prevention of Deformities Following Thoracoplasty. J. D. Murphy, Ila J. Amrhein, Frank P. Ilasi, B. B. Bagby and W. S. Schwartz, Am. Rev. Tuberc., 66:436-448, Oct. 1952.

Disturbances of Vibratory Sense (Pallesthesia) Associated with Nerve Root Compression Due to Herniated Nucleus Pulposus. Arch. Neurol. & Psychiat., 68:377-379, Sept. 1952.

Some Ideas on Possibilities for Future Classification, Training and Standards of Medical Technologists. Frieda Claussen, Am. J. M. Technol., 18:85-89, Mar.-April 1952.

Premenstrual Tension and Its Relationship to Water Metabolism. William Bickers, Am. J. Obst. & Gynec., 64:587-590, Sept. 1952.

Body Mechanics of the Bed Patient as Related to Occupational Therapy. Carlotta Welles, Am. J. Occup. Therapy, VI:197-202, Sept.-Oct. 1952.

Possible Role of Proprioception in the Extraocular Muscles. Elek Ludvigh, Arch. Ophth. 48:436-441, Oct. 1952.

Control of Ocular Movements and Visual Interpretation of Environment. Elek Ludvigh, Arch. Ophth., 48:442-448, Oct. 1952.

Starvation and Nutritional Balance. Josef Brovek, J. Am. Dietet. A., 28: 917-926, Oct. 1952.

Footrest Device for Exercising of the Lower Extremities by Bedridden Patients. Joseph O. Smigel and John H. Gibson, J. A. M. A., 150:587, Oct. 11, 1952.

A Psychometric Comparison of Achieving and Non-achieving College Students of High Ability. Henry H. Morgan, J. Consult. Psychol., 16:292-298, Aug. 1952.

Relationship of Surgery of the Nose and Throat to Poliomyelitis. Alden H. Miller, J. A. M. A., 150:532-534, Oct. 11, 1952.

Occurrence of Poliomyelitis in Relation to Tonsillectomies at Various Intervals. Franklin H. Top, J. A. M. A, 150:534-538, Oct. 11, 1952.

Relationship of Tonsillectomy to Incidence of Poliomyelitis. James L. Wilson, J. A. M. A., 150:539-541, Oct. 11, 1952.

Health Education Through Compulsory State Disability Compensation Programs. John E. Farrell, J. A. M. A., 140:654-659, Oct. 18, 1952.

Simplified Arm Sling. George J. Karfiol, J. A. M. A., 150:686, Oct. 18, 1952.

Multipurpose Brace: A Useful Adjunct in Rehabilitation. William Benham Snow, J. A. M. A., 150:687, Oct. 18, 1952.

Evaluation of Standard Anticonvulsant Therapy in Three Hundred Nineteen Patients. Melvin D. Yahr, Daniel Sciarra, Sidney Carter, and H. Houston Merritt, J. A. M. A., 150:663-667, Oct. 18, 1952.

Impact of Medical Care Plans on the Medical Profession. Arthur M. Master, J. A. M. A., 150:766-770, Oct. 25, 1952.

How many physical therapy students have you recruited this month?

Schools of Physical Therapy

APPROVED BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS
OF THE AMERICAN MEDICAL ASSOCIATION

Graduates of these schools are eligible for membership in the American Physical Therapy Association.

California

School of Physical Therapy
Children's Hospital Society
4614 Sunset Blvd., Los Angeles 27
(Univ. of California, Los Angeles)

School of Physical Therapy
College of Medical Evangelists
White Memorial Hospital
Boyle & Michigan Aves.
Los Angeles 33

Department of Physical Therapy
University of Southern California
University Park
Los Angeles 7

Curriculum in Physical Therapy
School of Medicine
University of California
3rd & Parnassus
San Francisco 22

Division of Physical Therapy
Stanford University
Stanford

Colorado

School of Physical Therapy
Department of Medicine
University of Colorado
4200 East Ninth Ave.
Denver 7

Connecticut

School of Physical Therapy
University of Connecticut
Box U 101
Storrs

Illinois

†*School of Physical Therapy
The Medical School, Northwestern University
303 East Chicago Ave.
Chicago 11

Iowa

†Department of Physical Therapy
State University of Iowa
University Hospitals
Iowa City

Kansas

School of Physical Therapy
University of Kansas — Medical Center
Kansas City 3

Louisiana

†Charity Hospital School of Physical Therapy
1532 Tulane Ave.
New Orleans

Massachusetts

*Course in Physical Therapy
Bouve-Boston School
Medford 55
(Tufts College, Medford)

*Program in Physical Therapy
Simmons College
Children's Medical Center
300 Longwood Ave.,
Boston 15

*Department of Physical Therapy
Boston University
Sargent College of Physical Education
6 Everett St.
Cambridge 38

Michigan

Curriculum in Physical Therapy
Dept. of Physical Medicine & Rehabilitation
University Hospital
University of Michigan
1313 East Ann St.
Ann Arbor

Minnesota

Course in Physical Medicine
The Medical School
University of Minnesota
Minneapolis 14

†School of Physical Therapy
Mayo Clinic
Rochester

Missouri

Department of Physical Therapy
Division of Auxiliary Medical Services
School of Medicine
Washington University
Barnes Hospital
600 S. Kingshighway
St. Louis 10

Division of Health & Hospital Services
St. Louis University School of Nursing
1402 South Grand Blvd.
St. Louis 4

---

* Only women accepted.
† Only certificate awarded.

New York

*Physical Therapy School
Albany Hospital
New Scotland Ave.
Albany 1
(Russell Sage College, Troy)

Program in Physical Therapy
University of Buffalo
2183 Main St.
Buffalo 14

Division of Physical Therapy
College of Physicians & Surgeons
Columbia University
630 W. 168th St.
New York 32

Curriculum in Physical Therapy
School of Education
New York University
Washington Square
New York 3

North Carolina

†Division of Physical Therapy
School of Medicine
Duke University
Durham

Ohio

School of Physical Therapy
The Frank E. Bunts Educational Institute
Euclid & East 93rd St.
Cleveland 6
(Cleveland Clinic)

Pennsylvania

†The D. T. Watson School of Physiatrics
Leetsdale

Division of Physical Therapy
School of Auxiliary Medical Services
University of Pennsylvania
1818 Lombard St.
Philadelphia 46

Texas

†Grady Vaughn School of Physical Therapy
Baylor University Hospital
Dallas 1

†School of Physical Therapy
Hermann Hospital
Houston 5

School of Physical Therapy
The University of Texas — Medical Branch
Galveston

Virginia

Physical Therapy School
Baruch Center of Phys. Med. & Rehabilitation
Medical College of Virginia
Richmond 19
(Richmond Professional Institute)

Wisconsin

Section in Physical Medicine
Medical School
University of Wisconsin
Madison

U. S. Army Medical Service

†*Medical Field Service School
Brooke Army Medical Center
Fort Sam Houston, Texas

Write to: Physical Therapy Section
Women's Medical Specialist Corps
The Surgeon General, Dept. of the Army
Washington 25, D.C.

---

* Only women accepted.
† Only certificate awarded.

A. P. T. A. Poster Contest

(See Initial Announcement in January *Review*)

Purpose — to publicize Physical Therapy and help recruit at least 1000 students in 1953 — 50,000 posters will be printed for distribution by chapters.

Eligibility — Anyone may enter the contest.

Description — Size 11" x 14". Entries may be on any type white paper except news strip. Must be in ink — not pencil. The following colors may be used: yellow, red, blue or black. If a photograph is to be part of the poster enclose photograph in cellophane holder — do not attach to poster — leave space where it is to appear.

Content — An attractive design with catchy slogan and just enough information to depict physical therapy, the need, and where to obtain more information. (American Physical Therapy Association, 1790 Broadway, New York 19, N. Y.

Prizes — $75.00 to the individual who submits the winning design; $25.00 to the Chapter or Chapter District sponsoring the winner.

Contest Closes — April 1, 1953. No entry received after this date can be considered.

Judges — To be announced.

Address — All entries should be sent to:

Poster Contest
American Physical Therapy Ass'n
1790 Broadway
New York 19, New York

General News

Dr. Rusk Honored

Dr. Howard A. Rusk, Director of the Institute of Physical Medicine and Rehabilitation New York University-Bellevue Medical Center, was named the 1952 winner of the Dr. C. C. Criss Award of $10,000 and a gold medal, in recognition of his work in rehabilitating the physically handicapped.

The selection of Dr. Rusk was announced December 14 by V. J. Skutt, president of Mutual of Omaha, one of the largest health and accident associations in the world, which established the award in memory of the late Dr. Criss, founder of the organization.

The award was established to honor outstanding contributions in the fields of health and safety. It is not limited to medical men but is open to anyone in the United States, Canada, Alaska, and the Hawaiian Islands, where Mutual of Omaha serves.

The winner is chosen by a board of judges headed by Dr. C. W. Mayo of the Mayo Clinic, Rochester, Minn. The board is composed of fifteen members, including leaders in medicine and public health, as well as representatives of other professions.

The medical and public health members of the board include Dr. John W. Cline of San Francisco, former president of the American Medical Association; Dr. Leonard A. Scheele, Surgeon General of the United States Public Health Service, and Dr. Thomas Parran, former Surgeon General of the health service and now at the Graduate School of Public Health, University of Pittsburgh.

Other members include Paul Martin, Minister of National Health and Welfare, Dominion of Canada; Lieut. Gen. James H. Doolittle of the Air Force, now a vice president of the Shell Oil Company; William M. Jeffers, retired president, Union Pacific Railroad, and Ned Dearborn, president of the National Safety Council.

Dr. Rusk was chosen from among more than 150 nominees. His previous honors include the Lasker Award in public health, the American Design Award for work in the field of rehabilitation and the Distinguished Service Medal. He was a colonel in the Medical Corps during World War II. He is consultant in medical rehabilitation to the Secretariat of the United Nations, the Veterans Administration and the New York City Department of Hospitals.

"Dr. Rusk has helped bring new hope to a hitherto helpless and defeated segment of our population, the some 23,000,000 physically handicapped," said Mr. Skutt in announcing the award.

"Probably more than any other American, he has demonstrated that the physically handicapped can be taught to become socially and economically self-sufficient," he added. "The production capacity added to our economy through his work alone would be a tremendous figure. The worth of salvaging human lives through his endeavors cannot be measured."

Winners in 1951 were Dr. Edward C. Kendall, biochemist, and Dr. Philip S. Hench, physician, for their joint achievement in the use of cortisone and ACTH in rheumatoid arthritis and other chronic diseases, for which they also won the Nobel Prize. The award will be presented to Dr. Rusk early this year.

Norman Acton Heads Committee To Aid World's Children

Norman Acton, the newly-elected Chairman of the Non-Governmental Organizations Committee on UNICEF, is Assistant Secretary General of the International Society for the Welfare of Cripples. He formerly served as Executive Secretary of the United States Committee for the Resettlement of the Physically Disabled, a project which the International Society carried out at the request of the International Refugee Organization to secure resettlement and rehabilitation opportunities for displaced persons with physical disabilities. Since 1950 he has been the ISWC representative on the Committee of International Non-Governmental Organizations working with the UN Children's Fund.

At the April 1952 session of the UNICEF Executive Board, approval was granted giving consultative status to the members of the Non-Governmental Organizations Committee on UNICEF. The active interest and support of non-governmental organizations, international and national, have been an important factor in the success of UNICEF (United Nations International Children's Emergency Fund). Non-governmental organizations have helped to build popular awareness of the significance of UNICEF both in countries contributing to the Fund and in countries receiving assistance from it, by publicizing and explaining its aims and the character of its operations.

Abstracts

Transplantation of Hamstring Tendons to Femoral Condyles in Order to Improve Hip Extension and to Decrease Knee Flexion in Cerebral Spastic Paralysis

G. W. N. Eggers, M.D., J. BONE & JOINT SURG., 34:827–830, Oct. 1952.

To correct knee and hip flexion in a person afflicted with cerebral spastic paralysis in order to permit an improved walking gait always has been a difficult procedure. The hamstring muscles, which are inserted into the medial and lateral tibial condyles, are strong flexors of the knee joint. In the erect walking position, they flex the knees; and to maintain balance, the patient must flex the hips. Thus, the improvement of knee extension must be accompanied by improved hip extension. The knee extension can be improved by the division of the patellar retinacula which permits the quadriceps femoris to act on the tibia. The hip flexion can be relieved by the procedure of transplanting the tendons of the semimembranosus, semitendinosus, gracilis, and biceps femoris to the respective posteromedial and posterolateral sides of the femoral condyles. The contraction of the hamstrings after transplantation acts to extend the hip and indirectly to retain extension of the knee.

The author describes these operative procedures. The surgery must be followed by walking instructions because the patient is unaccustomed to the new walking posture. The best results are probably apparent about one year after the surgical procedures. When evaluating the final result, one must remember, however, that the patient is still spastic. The author recommends that for the best results both the patellar retinacula and hamstring transplantation be performed.

Phantom Limb in Paraplegic Patients

Albert W. Cook and William H. Druckemiller, J. NEUROSURG., IX:508–516, Sept. 1952.

Phantom limb syndrome is the persistent knowledge of body schema following removal of any part of that schema. This syndrome has been recorded in a large percentage of amputations. Pain is not a constant feature. Some authors have assigned the characteristics of phantom limb to three levels of neural activity: the psychogenic, the sensori-motor cortex, and the peripheral nerve. These authors introduced the term "natural phantom" which does not include pain in the syndrome.

Two case histories of phantom limb in paraplegics are presented. From observations made, it would seem that: (1) natural phantom limb is not dependent on stimuli from the peripheral nerve of the stump or other structures of the stump; (2) part of the associated phenomena in this syndrome depends upon normal function of part of the spinal cord and peripheral neuromuscular structure; (3) ability of the human brain to recall the memory of the body schema is a primary factor; (4) presence of phantom limb is dependent upon neural networks in the temporal area as well as previously considered parietal areas; (5) there is need for reconsideration and reorientation of present methods of management.

Dysphasia in Left-handed Patients with Unilateral Brain Lesions

M. E. Humphrey and A. L. Zangwill, J. NEUROL., NEUROSURG. & PSYCHIAT., 15:184–193, Aug. 1952.

This is a study of cerebral dominance with reference to handedness, especially left-handedness. Left cerebral hemisphere damage in a right-handed person with its resultant effects on speech and allied functions was reviewed. It was assumed the same effects would occur with damage to the right cerebral hemisphere in a left-handed person. "Crossed aphasia," a term suggested by Bramwell, occurs when there is a lesion in the ipsilateral hemisphere of a person's preferred hand. If a person is ambidextrous there seems to be more immunity from grave defects of speech when there is damage to either hemisphere.

Records from a U.S. Naval Hospital were reviewed by these authors and selection of cases for study was based on the following criteria: (1) the lesion was strictly unilateral; (2) the patient was adequately tested for dysphasia; (3) if there was no dysphasia, the lesion must be such as to interfere with speech had it occurred on the dominant side; (4) adequate information as to left-handedness was available; and (5) the patient must have had at least average pretraumatic intelligence. There were ten cases studied, five with lesions of the left side and five with right-sided lesions. All were predominatelyl left-handed.

Some language difficulty was discovered in all patients except one, regardless of the site of lesion. There is support of the hypothesis that cerebral dominance either does not occur in left-handed persons or it is not as well developed as in right-handed persons. Some theoretical implications about handedness are discussed.

A Clinical Evaluation of Tendon Transplantations for Poliomyelitis Affecting the Lower Extremities

Raymond F. Kuhlmann, M.D. and John F. Bell, M.D., J. BONE & JOINT SURG., 34:915–926, Oct. 1952.

The authors present a historical review of the literature supplemented by an extensive bibliography. The case records of 1,555 patients with paralytic poliomyelitis, extending over a period of approximately thirty-five years from 1914 to 1949 were reviewed. Among these patients 255 persons had had one or more tendon transplantations about the knee, ankle, or foot. It was possible to interview personally and to examine 162 patients who represented some 395 separate tendon transplantations.

The general principles of tendon transplantation which have been carefully formulated by earlier observers were reiterated. This study confirms many of these principles, and includes: proper selection of cases, correction of fixed deformities, adherence to standard operative plans and technics, attention to postoperative fixation and care, and attention to convalescent protection and care.

The results of this clinical study seem to indicate that, with the exception of the group with tendon transplantations about the knee, in which objective improvement was slight, tendon transference, as performed in the region of the ankle and foot, particularly when combined with tarsal arthrodesis, is a feasible and successful orthopaedic procedure. It should be emphasized that the success of the procedure depends upon the proper selection of cases and the rigid adherence to the other criteria for tendon transplantation.

Prizes for the winning poster designs

Annual Conference Research Section

June 14-20, 1953

Will you be one of the lucky individuals to enjoy the stimulating fellowship of your professional colleagues this year?

Will you present a paper at the Research Section during the Dallas meetings? If you hope to, send your tentative title to American Physical Therapy Association, 1790 Broadway, New York 19, N. Y. by *March 15, 1953*. Abstracts must be submitted in triplicate not later than *April 15, 1953*.

Will you discuss a paper? Indicate your willingness by sending your name to the New York office by March 15, 1953. For more detailed information and application form consult your chapter president or physical therapy director.

The Benefit of Respiratory Exercises in the Emphysematous Patient

Warde B. Allan, M.D. In the AM. J. M. SC. 24:320-323, September, 1952.

In summarizing briefly the mechanics and physiology of emphysema, it is apparent that the lung volume and the residual air are greatly increased, while the ventilatory exchange is greatly reduced, and the vital capacity usually is reduced. The maximum breathing capacity is always considerably below the estimated normal. As the early stages of emphysema are not recognizable, it is almost impossible to prevent or to retard its gradual and sometimes rapid development, and in the treatment of the established state most measures have been without effect.

After observing many cases of emphysema, Allan felt that exercises might be employed, stressing upper abdominal and lower thoracic breathing thus bringing the diaphragm into a more active role during respiration. In the past three and one-half years he has taught special respiratory exercises to more than 235 patients who have emphysema. Most of these patients have had an associated bronchitis, and most of them were in the older age group. The results have been good.

It is of paramount importance to impress upon the patient who is being taught such exercises that his breathing mechanism can be helped. It is then demonstrated to the patient that instead of struggling to make the thorax move, it is much better and simpler to use the abdominal muscles. It is shown that the expiratory phase of respiration is the important feature, and instead of being passive he is able to make it active, with the result that the inspiratory phase becomes passive rather than active. These patients can rapidly accommodate their respirations to conform with this newer concept.

It is explained to the patient that this treatment is useful in chronic chest diseases in which there has developed constant outflow obstruction. This also applies to asthma of long duration which has resulted in obstructive emphysema more severe than the paroxysmal episodes of asthma. The purpose of the treatment is to reeducate the respiratory pattern to an involuntary continuous function in which emphasis is placed on expiration as the active phase and inspiration as the passive phase. It is emphasized that there is no set of exercises which can be mimeographed and handed to patients to be done at home. The importance of individual differences and the day to day developments cannot be overemphasized nor can they be anticipated. Therefore, each patient is a different problem, and the specific prescriptions are made every day according to progress made and stumbling blocks which develop.

A series of exercises devised for Allan by a qualified physical therapist is included in this article. They have been found to be a useful adjunct in the treatment of emphysema.

Problem of Muscular Dystrophies

R. H. Ramsay, M.D., and H. R. McCarroll, M.D., J.A.M.A., 150: 659–662, Oct. 18, 1952.

In an effort to clarify the confusion of terminology and to discern some of the natural history of the disease, the authors reviewed 225 cases of children afflicted with muscular dystrophies, muscular atrophies and clinically similar conditions at the Shriner's Hospital for Crippled Children in St. Louis. These diseases were classified into myopathies, characterized by the primary degenerative changes within the muscle, and neuropathies, characterized by changes in the muscle secondary to disease of the nervous system. According to this classification there were 231 cases of myopathies and 24 cases of neuropathies.

The myopathies were further subdivided into the childhood type and the fascioscapulohumeral type of progressive muscular dystrophy. Justification for this division was based on the age of onset and the gross dissimilarities in the clinical manifestations. Two hundred and twenty-seven cases were diagnosed as the childhood type of progressive muscular dystrophy. This heredofamilial disease appeared clinically as early as one year and as late as thirteen years. The ratio between males and females was approximately 8 to 1. There was progressive weakness, usually continuous, appearing first in the trunk pelvis and shoulder muscles and later in the distal musculature. It was usually characterized by pseudohypertrophy of the calf muscles. The patient "climbs his frame" when rising from a supine position. No effective treatment is known. The authors

feel surgery should be avoided. Of the fascioscapulohumeral type of progressive muscular dystrophy, four cases were reported. This disease usually appears in an older age group than that seen in the crippled children's hospital. The fascial and pectoral girdle muscles were affected first. The creatine and creatinine alteration and the microscopic pathological condition were identical in the two types but the prognosis was much better in the latter group.

Neuropathies, or progressive muscular atrophies, were separated from the progressive muscular dystrophies by the evidence that muscular wasting was secondary to disease of the nervous system. Biopsy analysis showed that atrophic muscle fiber bundles were found next to normal bundles. This gave a picture of patchy atrophy. Of the 24 cases of neuropathies encountered, 20 presented Charcot-Marie-Tooth disease findings. In the remaining four, infantile progressive atrophy of the Werding-Hoffman type and the so-called amyotonia congenita disease were recorded. Age of onset in all types of neuropathies varied from one year to middle life and progression of the disease varied. There was an insidious developing weakness of the feet, lower leg, and hands which progressed to the more proximal muscles. Heredity may have been dominant, sex-linked recessive or simple recessive. There is no known treatment but surgical correction of deformities of the feet may be beneficial. Muscular atrophy is due to the loss of innervation. Whether this loss is due to degeneration of the anterior horn cells or of the peripheral nerves is controversial.

Findings of these authors supported the conclusion of Brandt that he could not confirm the clear cut existence of a disease corresponding to the amyotonia congenita described by Oppenheim.

Progressive Motor Neuron Disease in Adults

Ragnar Müller, ACTA PSYCHIAT. ET NEUROL., XXVII, Fasc. 1–2:137–156, 1952.

Müller reviews the current concepts regarding the pathogenesis of amyotrophic lateral sclerosis, bulbar paralysis, and spinal muscular atrophy. He reports on a survey of all the records in the Neurological Department of the Serafimer Hospital from the years 1932 to 1947 with the diagnosis of one of these diseases. Of the total 197 cases, 98 had a clinical picture of amyotrophic lateral sclerosis, 48 had bulbar paralysis with and without spinal muscular atrophy, and 44 had spinal muscular atrophy. There were twice as many men as women in the total group studied. The distribution of the sexes, however, did not hold this relationship when classified according to type of disease. First admission into the hospital ranged from less than one year to over four years after onset of the disease. One year after admission 46 per cent of the patients had already died. During an observation period of 3 years 80 per cent of the patients observed died. Only 6 per cent of the patients with an observation period of 10 years were still alive at the end of that time.

The author found that quite apart from the clinical findings, the younger the patient the less rapid the progress of the disease. The prognosis was more favorable when at the onset of the disease the amyotrophies are distributed proximately on the extremities or concentrated exclusively in the lower limbs.

Diagnosis and Treatment of Scapulocostal Syndrome

Allen S. Russek, M.D. J.A.M.A. 150:1:25, September 6, 1952.

The objectives of treatment of scapulocostal syndrome are to desensitize the sensitive and trigger points, so breaking the reflex mechanisms, and eliminating the cause. In all cases the cause must be treated specifically from the start. Those with exaggerated lumbar lordosis and round shoulders should wear a properly fitted garment to restore more normal alignment. At the same time, the patient must be made posture conscious and be instructed to assume good posture periodically throughout the day. Postural exercises may sometimes be very effective. Instruction in proper sitting, working, and sleeping positions must be given. In secondary cases, treatment for the initial lesion must be continued to eliminate it.

The static cases require mechanical devices for restoring balance of the shoulder girdles. Cumulative small degrees of trauma must be avoided in paralyzed patients. These patients do not respond well to heat, and massage usually makes them worse.

Simple Traction Device

E. H. Weissenberg, M.D., Myron W. C. Grattendick and W. Lensing. In J.A.M.A., 149:15:1398, August 9, 1952.

This reports the case of a patient who sustained third degree burns of both legs nine weeks previous to the beginning of this treatment. Strong flexion contractures in both hips and knees had developed. He was referred to the department of physical medicine for restoration of normal function of the contracted joints and for strengthening of the severely atrophied muscles of both legs.

None of the usual orthopedic or physical therapy technics for mobilization of hip or knee contractures could be used in this case. Adhesive tape traction requires healthy skin, therefore this was not feasible; skeletal traction could not be considered, because it would have been necessary to drill the Kirschner wire through denuded and infected skin, which could result in osteomyelitis; passive and assistive motion would have been too painful, because the legs could not be gripped without including parts of the burned areas; manual traction could not be performed, because what healthy skin was left had become macerated from wet packs and was too slippery to provide a firm grip. Nevertheless, the joints had to be moved by some method as soon as possible to prevent a seriously crippling condition to result from the contractures.

A traction device consisting of a masonite board and two small carriages was put on the bed. Both heels were placed on gauze "doughnuts" and, with these, onto the carriages. A folded towel was placed under the foot end of the masonite board to produce an inclined plane, with the foot end of the board higher than the head end, because the patient's pain was too severe while the board was in the horizontal position. It was noted that the carriages had a tendency to roll toward the head, thus increasing the flexion contractures; however, the weight of the legs not only nullified this tendency but even made the carriages move gradually against gravity toward the end of the foot board. The patient was left in this position, since it did not seem painful to him, and after 24 hours on the traction device his legs were almost straight. Active hip and knee exercises were then begun, using the device for assistive force as long as the muscles were too weak to perform these movements unassisted.

This same equipment can be used effectively for arthritic patients or postoperatively in cases in which an effective traction device is required. The tractive force is easily regulated by merely changing the incline of the board according to the patient's tolerance. It is an inexpensive device and can be improvised without difficulty.

Tendon Transplantations in the Lower Extremity. I. Tendon Transplantations About the Foot and Ankle

John A. Reidy, M.D., Thomas F. Broderick, M.D., and Joseph S. Barr, M.D., J. BONE & JOINT SURG., 34: 900–908, Oct. 1952.

This is the first of two papers presented by the authors in an attempt to determine which of the available tendon transplantations is most beneficial in a given case of weakness or deformity caused by poliomyelitis. The long-term end results of tendon transplantations about the foot and ankle in 100 poliomyelitic patients have been studied. In all but a few instances, the transplantation was an adjunct to bone stabilization of the foot. The peroneal tendons were most frequently transplanted. Transplantations to reinforce power in dorsiflexion were done more frequently and in general were more successful than were the posterior transplantations which were done to improve plantar flexion. Approximately one third of these operations were rated as failures, one third as fair, and one third as good to excellent. The presence of good muscle power before operation favorably influenced the end result. Transplantations done before the age of eleven were likely to be unsuccessful, and reoperation was necessary in 60 per cent of these cases.

It would appear from this study that, in the presence of good muscle power about the foot and ankle, triple arthrodesis without tendon transplant produces an excellent functional result. This is especially true if the deformity or instability can be treated conservatively until the patient is at least thirteen years old. There is some evidence that arthrodesis of the interphalangeal joints of the toes may be sufficient to correct the deformity of "cock-up" toes and to permit the toe extensors to dorsiflex the foot without transplanting the tendons to the metatarsal necks.

In general, the combined operation of arthrodesis and tendon transplantation should be reserved for feet with marked muscle imbalance. In properly selected cases, tendon transplantation improves the result of arthrodesis by reinforcing power in dorsiflexion or plantar flexion and may prevent recurrence of deformity caused by unbalanced muscle pull. In this study the authors have learned that no two cases of poliomyelitis are identical; that restoration of a weakened foot to normal strength and function is impossible. Nevertheless, tendon transplantation, when combined with stabilization procedures, may markedly improve function of the foot.

Guided Symphysis: Functional Prophylaxis in Exudative Pleurisy and Pneumothorax Fluid

G. Birath. AM. REV. TUBERC., 66:2: 134, August 1952.

Ventilation insufficiency is one of the commonest causes of pulmonary insufficiency, and preventive measures should be directed against the condition generally responsible for ventilatory impairment, viz., pleurisy with effusion and pneumothorax fluid. The role of the diaphragm in this connection is particularly stressed in this article.

A program of prophylaxis is described and consists of adoption of the lateral posture with the affected side uppermost and breathing exercises. Repeated, deep respirations prevent undesirable adhesion of the diaphragm to the chest wall and the formation of pulmonary adhesions on sites unfavorable for function. The patient is therefore instructed to take about fifteen deep breaths each hour.

Physical therapy also includes abdominal breathing, so that the greater part of the ventilatory movements is performed by the diaphragm and not by the thoracic cage. When performing breathing exercises the patient should, of course, adopt those postures in which the diaphragmatic movements bring about maximum opening of the costophrenic sulcus, viz., the lateral posture with the affected side uppermost, and forward and backward rotation from this posture.

At a later stage in therapy the patient is taught to breathe selectively in order to increase the mobility of the ribs on the affected side. This is achieved most easily by breathing against resistance, for example, a band held around the thorax.

There is a question as to whether breathing exercises should be begun in the initial stage of pleurisy, when the patient is still febrile, or should wait until the temperature has become normal. In the hundred or more patients treated up to the present, therapy was begun as soon as the patient entered the hospital, regardless of the stage of the disease, and no untoward effects have been observed. Naturally, some caution in the performance of breathing exercises is advisable in the most acute phase of the illness, but posture therapy need not be modified and may be instituted without delay.

Sometimes a patient cannot understand fully the instructions for breathing exercises or is physically unable to cooperate. There may be reflex immobility of the diaphragm in the initial phase of pleurisy. In such cases diaphragmatic movements can be artificially produced by stimulation of the phrenic nerve with the electrophrenic respirator devised by Sarnoff and associates.

Tendon Transplantations in the Lower Extremity. II. Tendon Transplantations at the Knee

Thomas F. Broderick, M.D., John A. Reidy, M.D., and Joseph S. Barr, M.D., J. BONE & JOINT SURG., 34: 909–914, Oct. 1952.

In an effort to increase the knowledge concerning tendon transplantations at the knee, the authors reviewed the literature on this subject and have studied the end results of a group of patients upon whom this operation had been performed. An evaluation was made of 38 patients in whom 39 transplantations at the knee were done between 1922 and 1946 with an average follow-up of nine and two-tenth years. The subjective results were similar to those in other reports and were in general good, but on objective grounds the results were disappointing.

Knee-extension power following tendon transplantation was rated fair or better in only 30 per cent of the cases. Seven of twelve patients using braces preoperatively were enabled to discard their braces. Even in these apparently successful cases the effect of the tendon transplantation and of other operative procedures could not be evaluated separately.

Poster Contest Closes April 1, 1953

Comparison of the transplantation cases with control groups with similar patterns of muscle weakness leads the authors to draw certain important conclusions. The function of the extremity, as well as the ability to walk without apparatus, is dependent on a number of factors. There has been a tendency to assume that the most important factor is quadriceps or extensor power. This study suggests that other factors are of equal importance. Good hip, posterior thigh, and calf musculature will permit excellent function, even when the quadriceps is paralyzed. On the contrary, the extremity with good quadriceps power and poor posteriormusculature usually requires bracing. Good power in extension of the knee is less important in brace-free walking than is a stable foot and good posterior musculature. Tendon transplantation at the knee in some instances impairs function by the production of hyperextension deformities, dislocation of the patella, or lateral instability.

Although a number of cases in this series have apparently been greatly benefited by muscle transplants, others must be rated as failure.

The indications for tendon transplantation to improve extensor power of the knee are not easy to formulate. It is our belief that in the past such operations have been done too frequently.

We are indebted to the following for abstracting articles for the *Physical Therapy Review:*

Louis Cotovsky
Eunice J. Mesmer
Thelma Pedersen
June M. Schroeder
Marilyn Wald

Book Reviews . . . . .

The Croonian Lectures on Muscular Movements and Remarks on Paralysis of the Movements of the Trunk in Hemiplegia *by the late Charles Beevor, M.D., F.R.C.P., Edited and reprinted for the Guarantors of "Brain", with a Foreward by F. M. R. Walsche. Paper binding; price $2.00. Pp. 79. Macmillan and Co., Limited, St. Martin's, London, and New York, 1951.*

It is good news, indeed, that the classical lectures on "Muscular Movements," delivered in 1903 by Dr. Charles Beevor before the Royal College of Physicians in London, and his paper, "Paralysis of Trunk Movements in Hemiplegia," which appeared in the British Medical Journal in 1909, have been reprinted in pamphlet form.

The name of Charles Beevor, no doubt, is known to every student of kinesiology. References to Beevor's lectures are found in many textbooks, yet, the lectures as such have not been published previously. Anyone, like this reviewer, who is a hunter of originals should be delighted that this gem of a publication is now available.

In his first lecture the author stresses the inadequacy of studying muscle action on the cadaver or by electrical stimulation. "It does not follow because a certain movement can be produced by a joint by traction on the dissected muscle that therefore the muscle must be used during life for this movement, as it may not be advantageous to use the muscle for this purpose." . . . "It seems to me that, although the two former methods (anatomical, electrical) will tell us what a muscle *may* do, it does not tell us what a muscle *does* do." Beevor advocates the studying of the action of muscles by the physiological method. "A living person is told to perform a definite movement, and it is then observed which muscles take part in this movement."

Statements made by prominent scientists, such as John Hunter, James Benignus Winslow, Hughlings Jackson, Duchenne and Sherrington are given due consideration and credit. John Hunter in 1777 said "There is no one muscle in the body which we can throw into action separately and independently of the collateral effects of others," and Hughlings Jackson wrote "nervous centers know nothing of muscles, they only know movements." These are fundamental principles established a long time ago, to which Beevor wishes to draw the reader's attention.

The predetermined way in which muscles act to produce movement is stressed throughout the lectures. "An individual has no power voluntarily to leave a muscle out of a combination to which it belongs." Two sets of muscles, as for example the thumb extensors and ulnar flexors of the wrist, may be so intimately associated in a movement that "when one of the group is paralyzed by a peripheral lesion the other set of muscles goes on acting, as the innervation from the brain passes down just as if the whole complex could be thrown into action."

The question is raised whether or not *all* muscles which can take part in a movement do so, regardless of whether the movement is weak or strong. In the case of the motions investigated, Beevor finds that they do not, and that there is a definite sequence in which muscles are called upon to participate in the motion. "It . . . appears that the supinator brevis will do the work of supination when only the inertia of the bones has to be overcome, but as soon as work over one pound is required to be done, the biceps is called to help." In the case of wrist extension it was found that in extending the wrist with the fingers straight, the extensors of the carpus would not assist the finger extensors until a certain amount of work had been done by the finger extensors. "These two examples, I think, show that there is a definite order in which the muscles for the performance of a movement come into action."

The phenomenon of "paralysis of a muscle for one movement and not for another" is dealt with in some detail both in the Croonian lectures and in the second part of the pamphlet dealing with paralysis of trunk movement in hemiplegia. The observation was made, for example, that in hemiplegics the biceps was often paralyzed for supination but not for flexion, the upper trapezius for shoulder elevation, but not for head side bending, and the latissimus dorsi for arm adduction, but not for coughing.

The reading of Beevor's Croonian lectures should clarify to students of kinesiology the classical meanings of terms such as agonists (prime movers), synergists, antagonists and fixator muscles, terms which unfortunately have been used rather loosely and with different and often conflicting meanings by subsequent writers.

It may be argued that Beevor's physiological method of studying muscle action is outmoded, since more accurate and objective methods, such as electromyography, are now available. This reviewer will venture

to say that the physiological method will never be outmoded, and that Beevor's presentation is as valuable today as it was fifty years ago. It is true that observation and palpation of a muscle is a crude method of determining its state of contraction, as compared to the electromyographic method, and that a very slight change in tension cannot be discovered by the examiner's finger tips. Yet, in the hands of a skilled examiner, Beevor's method is a most useful tool both for diagnostic and therapeutic purposes.

The second part of this publication, "Remarks on Paralysis of the Movements of the Trunk in Hemiplegia," is timely and should be read with great interest by all therapists engaged in the rehabilitation of hemiplegics. The title in itself is intriguing, since it indicates that the paper deals with paralysis of *movements*, not of *muscles* or of *muscle groups*.

The discussion centers around a case of left hemiplegia. It was found that the muscles which perform lateral trunk side bending (rectus abdominis and erector spinae) did not act on either side when the trunk was on the left side of the midline, but contracted normally when the trunk was on the right side of the midline.

In one experiment the patient was lying on his back with the trunk bent to the left, so that a resistive trunk movement from this starting position to the midline and over to the right would involve a continuous action of the muscles of the right side. The patient was unable to perform the first part of the motion, but from the midline to the right, the right trunk muscles contracted normally. Therefore, "if this movement be made continuously from the left to the right, there must be a change of the representation of the movement from the 'motor' cortex of the right hemisphere to the left, when the midline is passed." In reversing the movement with resistance applied to the left trunk muscles, there was normal action of the muscles from the right side to the midline, but a paralysis beyond that point.

"The above apparent anomalies disappear if in dealing with hemiplegics we always remember Hughlings Jackson's dictum, that the brain knows nothing about muscles but only of movements, and all that we have to take into account is whether the movement takes place in the field of action on the right or on the left of the anteroposterior midline of the body."

In bilateral movements, such as head raising from the supine or prone positions, the rectus abdominis and the erector spinae contracted strongly on both sides, although the muscles on the hemiplegic side came into action later than on the other side.

In an effort to explain these phenomena Beevor speculates on how movements and muscle groups are represented in the cerebral hemispheres. Possibly, there is a change of representation of one and the same group of muscles from one hemisphere to the other accordingly as they act in right-sided or left-sided movements. The question whether movement requiring bilateral action of muscles is represented in one or in both hemispheres is also discussed. To the author's credit it must be said that at no time does he make definite statements on this difficult problem, but rather his discussion proceeds on a thinking-out-loud basis. A portion of Beevor's last lecture, the fourth, dealing with representation in the motor cortex, has been omitted by the editor, as containing views no longer held.

A Textbook for Medical Conditions for Physiotherapists. *By Joan E. Cash, B.A., M.C.S.P., (Teachers' Certificates). Hard cover; price, $5.00. Pp. 350 with 18 plates and 14 figures. Published for Faber and Faber, Ltd. by J. B. Lippincott Company, Philadelphia, 1951.*

This excellent reference of medical conditions written by a highly qualified British physical therapist should be of as much interest and value to the student as to the graduate physical therapist.

Miss Cash has successfully described the medical conditions most commonly encountered by a physical therapist as well as giving a brief picture of rare conditions or those seldom treated by physical medicine procedures. The book has been intentionally written in a simple, direct style with clearly defined headings and subtitles making the subject matter readily available to the student or therapist who wishes a rapid review without too great detail. The author has departed from her classification of medical conditions to include a chapter on physical treatment in the surgical group of respiratory conditions because, as she states in the preface, in many chest conditions the treatment alternates between medical and surgical and the physical therapist may administer treatment in both stages.

The book is divided into seven principal parts; namely, Pathological Changes, Rheumatic Affections, Diseases of the Respiratory System, Disorders of the Nervous System, Diseases of the Cardio-Vascular System, Disorders of Abdominal Viscera and Peritoneum, and some Common Diseases of the Skin and Its Appendages. The section on disorders of the nervous system is necessarily more lengthy than the others and makes up approximately one half of the total book. The author has attempted to simplify her explanation of neurological anatomy and pathology as much as possible and uses drawings and plates to aid her in this. Throughout the book the author's most common method of presentation is to first give a definition of the medical condition, the part or parts involved and the cause if known. She then follows with a discussion of the pathological changes, signs and symptoms, and finally the principles and an outline of treatment by physical means. This unity of organization of the material presented and the direct approach of the author, who does not get lost in details and speculations, are appreciable factors in making this a good textbook for students in physical therapy. It is perhaps too simplified to be a standard reference for medical men, but nevertheless even they could find useful information especially in the sections concerning the principles and outlines of treatment by physical means.

For American readers it should be remembered that our British counterparts have some differences in vocabulary, such as the use of the term "physiotherapist," which if we understand properly provide no real inconveniences. However, there are a few points of emphasis as far as principles and technics of physical treatment are concerned to which we may take exception. For example, massage, ultraviolet radiation, and the use of faradic, galvanic and sinusoidal currents seem to be in much more general use than normally employed in this country. Naturally, one can always find points of controversy but for the most part the author is fair and conservative in her statements. The importance of exercise in its various forms and early treatment with close cooperation between the physician and the physical therapist is put in proper emphasis.

It is not the aim of this text to give detailed physical therapy treatment programs for each of the medical conditions presented but rather to point up the rationale of treatment and the prognosis according to the pathology and changes involved. When there is no known physical treatment, the

author does not hesitate to so state.

Physical therapists, both student and graduate, should find this reference helpful toward the attainment of a better understanding of the overall medical picture of many of the conditions the therapist is called upon to treat.

Anatomie und Physiologie. Lehrbuch fuer aerztliches Hilfspersonal. *By Professor Dr. Med. Joseph Buecker, Hamburg. Seventh edition. (Translated from the German and reviewed by Johanna S. Zimmerman). Linen binding; price, DM. 16.50. Pp. 152, ill. 90. Georg Thieme Verlag, Stuttgart, Germany, 1952.*

In his preface Dr. Buecker states that the need for a suitable book of anatomy and physiology for medical personnel, such as technicians, nurses and X-ray technicians caused him to compile his own notes, gathered from his experience as a teacher of such personnel, into this manual. It was his aim to consider the various fields of specific interest to different groups of medical employees and to present the basic knowledge of anatomy and physiology in a manner which was concise yet exact. The fact that *Anatomie und Physiologie* is now in its seventh edition is an indication of the demand for this kind of book.

The manual is divided into two parts: a short general part covering cellular structure, cell division and tissues; and a special part in six chapters, covering the basic and essential facts concerning the structure and function of the human body. In view of the wide scope of subject matter, the material necessarily had to be greatly condensed, and it was perhaps unavoidable that some chapters received a more complete coverage than others. However, it might have been more satisfactory if the discussion of the nervous system and sense organs had been as complete as that of the muscular and especially of the skeletal system which, despite its briefness, is remarkably thorough. The chapter on blood and circulatory organs is well organized as is the discussion of the digestive system, where the difficult subject of the physiology of digestion is presented clearly and comprehensibly. Unfortunately, the description of the reproductive system is sketchy, as is the chapter on the skin.

The author has succeeded, however, in compiling a valuable manual for the student searching for pertinent and compact information. The choice, organization, and arrangement of the material are admirable. Of particular merit are the illustrations—commendable in all chapters but excellent in the chapter on myology.

The book is attractively bound, of convenient size, and is printed on good paper without much glare. Inclusion of a bibliography and especially of a glossary would improve the volume's value as a reference book. Nevertheless, *Anatomie und Physiologie* will prove helpful to all who seek a short and well written text on anatomy and physiology.

An Introduction to Physical Education. *By Eugene W. Nixon, Emeritus Professor of Physical Education, Pomona College, Claremont, Calif., and Frederick W. Cozens, Professor and Director of Physical Education, University of California. Fourth Edition. Cloth binding; price, $3.75. Pp. 271. W. B. Saunders Company, Philadelphia, Pa., 1952.*

This book, written primarily for the prospective teacher of physical education, presents good background material in physical education for professional students.

The authors' primary purposes are to acquaint their readers with the meaning of physical education and its place in the field of education as a whole, and to give them a feeling for their responsibilities as potential leaders of both young people and adults.

Therefore, after presenting the meaning of physical education, its place in education, its historical background and scientific foundations, the aims, objectives, and policies of physical education are discussed in such a manner that the reader soon realizes one should approach the goals of physical education in terms of the fundamental principles of education since, like all education, physical education is a process of modifying the individual.

The authors go on to discuss the physical education program itself, its evaluation, and its unique possibilities in developing desirable character traits and in training people for proper use of leisure time. The reader acquires a basic conception that the physical educator must determine the modifications needed to be brought about in the individual or group to be educated, also that he must be concerned with both the selection of activities through which this can best be accomplished and the provision of the type of environment that permits progression towards one's goals.

Concluding with a presentation of the professional outlook in the field of physical education, the authors discuss the qualifications and professional preparation required of physical education teachers and the various opportunities, including that of physical therapy, that are open to them.

Although this book is mainly orientation material for the professional student of physical education, parts of it, particularly the sections dealing with the characteristics of the various age groups and with the teaching of physical education skills, will be of interest to the physical therapy student.

The Adolescent and His World. *By Irene M. Josselyn, M.D., Member of the Staff, Institute for Psychoanalysis, Chicago, Ill. Paper; price $1.75. Pp. 124. Family Service Association of America, New York, 1952.*

Dr. Josselyn gives a concise, easily read general summary of the conventional psychiatric understanding of the adolescent's problems relating to personal development and social readjustment. There are ten main chapters describing physical and sexual growth and changes, the individual's struggle to achieve satisfying independence balanced between personal inclination and social pressures, and the role of psychiatric treatment when the adolescent does not receive enough assistance from supportive measures in his social environment.

This book would be very helpful to those who are, perhaps for the first time, seriously concerned with boys and girls in their teen age years, either their own children or those for whom they have the responsibility for guidance. There is a sprinkling of illustrative case histories to give concrete substance to the ideas presented. There is little or no discussion of controversial points of view, and the general assumption seems to be that adolescents are quite homogeneous in the essential character of their difficulties, and hence respond to the same fundamental psychiatric approach. Therefore the reader has a comparatively simple but substantial base from which to proceed to further study, or to use in a comparative manner in the attempt to understand the more divergent individual.

Cooperate with your chapter Recruitment Committee

Our Book Reviewers for February

Signe Brunnstrom, former Director of Physical Therapy, Kessler Institute for Rehabilitation, West Orange, New Jersey; lecturer and author of handbooks and articles on rehabilitation of the amputee.

Louise R. Hewson, Director, Department of Psychology, Neurological Institute, New York City.

Natalie Smith, Director of Teaching, Department of Physical Education, Bouve-Boston School, Boston, Massachusetts.

Eunice S. Wallis, Physical Therapist, Department of Physical Medicine and Rehabilitation, Gallinger Municipal Hospital, Washington, D. C.

Johanna S. Zimmerman, formerly Physical Therapist, Shadyside Hospital, Pittsburgh, Pennsylvania.

Classified WANT-ADS

WANTED: Physical therapist; qualified female for 450-bed general teaching hospital. Modern department, salary good with periodic increases, paid vacation and sick leave. Living quarters available if desired. Apply C. A. Robb, Superintendent of Roper Hospital, Charleston, S.C.

OPPORTUNITY FOR TWO PHYSICAL THERAPISTS who are interested in helping build and plan a rapidly growing outpatient department which will expand its services into a Rehabilitation Center in the near future. Excellent starting salary with opportunity for rapid advancement. Inquire Curative Workshop, 840 South Third St., Louisville, Ky.

WANTED: Additional physical therapist in active department 265-bed general hospital. Excellent working conditions. Includes care of poliomyelitis patients. Salary open. Write Mr. L. G. Trousdale, Administrator, St. Luke's Hospital, N. 830 Summit Boulevard, Spokane, Washington.

WANTED: Senior physical therapist for advisory service to nursing staff, supervision of physical therapy staff, and direct service to selected patients in an assigned territory; staff physical therapists for service to patients in their own homes under medical prescription and technical supervision. Salary dependent upon education and experience. Five-day week; liberal holiday, vacation, and sick leave allowance. Near two approved schools and a third now being organized locally; university facilities available locally for continuing study. Immediate placement. Write to Ruth E. Te Linde, Executive Director, Visiting Nurse Association, 1234 North Prospect, Milwaukee, Wisconsin.

CALIFORNIA—Physical Therapy Openings
Immediate placement for physical therapists with State Department of Public Health (in public schools) and State Department of Mental Hygiene (in hospitals). Good starting salary with generous increment. Liberal vacation and retirement system. Write Dept. P9, State Personnel Board, 1015 L Street, Sacramento 14, California.

WANTED: Physical therapist for department serving 7 hospital medical centers. Patients mostly orthopedic, many children. Treatments stress rehabilitation using swimming pool and functional room as well as usual modalities. As part of Clinics' research unit, department takes part in medical school program. Salary good, 4-week vacation, 2-week sick leave, use of University recreational facilities. Write to Nancy Watts, Chief Physical Therapist, University of Chicago Clinics, 970 E. 59th St., Chicago, Illinois.

PHYSICAL THERAPISTS: In hospital-school for rehabilitation of children with orthopedic handicaps. Complete interesting program. Good salary, merit increases, 11 paid holidays; 2 weeks' annual paid vacation. Sick leave accumulates 1 day per month to 60 days. Retirement plan after 1st year. Write Director of Physical Therapy, Illinois Children's Hospital-School, 2551 N. Clark, Chicago 14, Ill.

WANTED: TWO QUALIFIED PHYSICAL THERAPISTS to work in established department in 500-bed hospital. Work is supervised by specialist in physical medicine and rehabilitation. Good starting salary, vacation, sick leave and retirement benefits. Write: Herman J. Bearzy, M.D., Director of Physical Medicine and Rehabilitation, Miami Valley Hospital, Dayton, Ohio.

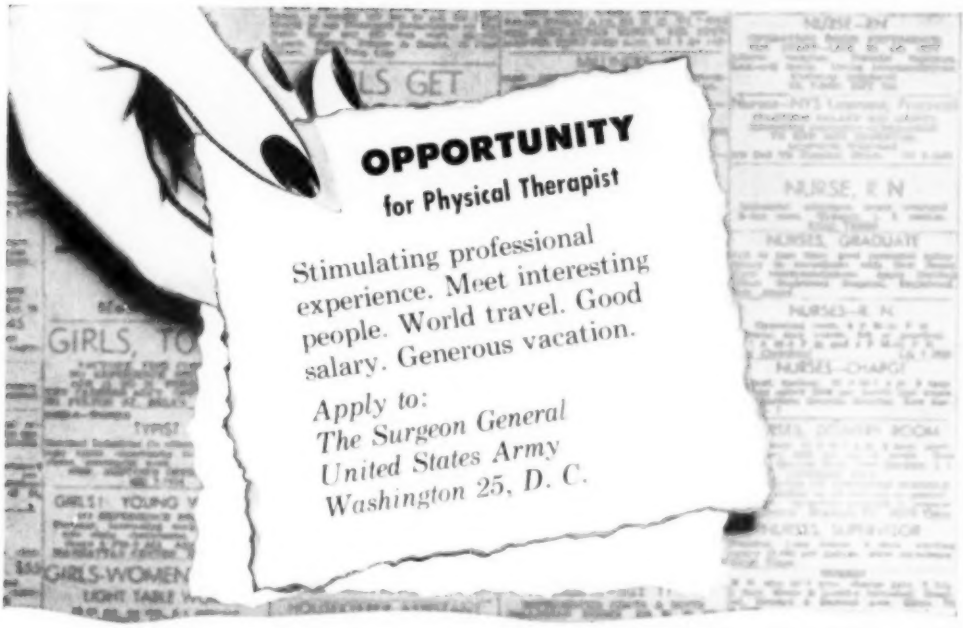
RATES

The rate per insertion is 75c per line. Typewrite your advertisement carefully and count 50 characters and spaces per line.

ALL WANT-ADS MUST BE PAID FOR IN ADVANCE. Make checks or money orders payable to the American Physical Therapy Association.

IMPORTANT

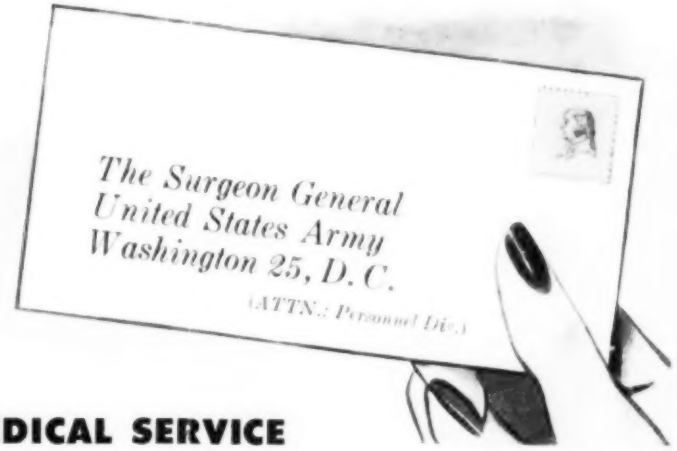
It is understood and agreed that the publisher shall have the right to reject or change the wording of any advertisement which in the opinion of the Editorial Board shall not be in agreement with the ethical standing of this publication.


OPPORTUNITY
for Physical Therapist
Stimulating professional experience. Meet interesting people. World travel. Good salary. Generous vacation.
Apply to:
The Surgeon General
United States Army
Washington 25, D. C.

Let's suppose you answer this "ad"

If you like meeting new people and working with a wide variety of patients—then you will find an exciting, new and satisfying life in the Women's Medical Specialist Corps. You will be in constant touch with the latest developments and techniques of physical therapy—and your work will take you all over the world. You serve as a commissioned officer, enjoying equal pay, equal rank, equal benefits with male officers. You get a good salary, a generous vacation. Most important of all, you will be doing a vital job in the interest of your country.

DON'T WAIT—
write today
for details . . .



U. S. ARMY MEDICAL SERVICE